COAL AGE

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Only Greater Efficiency Will Retard Mounting Costs

TRANSPORTATION limitations, uncertainties of legislation and labor unrest are the questions that are foremost in the minds of coal men today. Efforts to get more cars from the railroads, proceedings to forestall further government control of the coal business and joint conferences with the miners consume the time of the active coal operator and the officers of the representative associations. But in these daily struggles to maintain existence as an industry of individual effort do not lose sight of the ever-increasing necessity of greater engineering efficiency in production as a means of retarding the rise in the cost of production. Every element of cost—labor, supplies, general overhead and taxes—is mounting. The only hope of even retarding this rise is in increased efficiency of operation.

When prices of coal began to go up (in 1917) and all through 1918 coal companies generally took advantage of greater net income to modernize equipment. The process of putting the mines on a thoroughly modern basis was far from complete when the slump in the market took place in November, 1918. Business was slack and conditions uncertain last year, but there is no lack of orders in sight now and prices are good. The coal operator who did not put his mine equipment in down-to-date order during the war, because perhaps he did not see how he could ever amortize the inflated cost, was at a disadvantage last year when demand was so slack that the lowest bidder got the business. A year or two from now he will be in the same position.

Increased efficiency is not necessarily a corollary of the installation of modern machines. These machines must be properly used. In how many coal mines is underground traffic handled with such regard to its possibilities as is traffic on the Harlem River division of the New York Central? How many of the laborious operations required to get coal from the face to the tipple have been made the subject of studies such as have put our systems of factory management in the forefront in the world of industry? Use engineers more as well as equip your mines with the best the mechanical industry has to offer.

Increased output means lower unit cost. Inadequate car supply limits the day's production of most mines. Comparatively few mines are so situated that they can load coal directly onto waterways. However, a larger percentage than most realize can dispose of coal by motor truck. Driven to necessity by the strike of railroad labor, consumers in St. Louis have been hauling coal from the mines to their plants by motor truck. The idea is spreading.

It will be remembered that in 1918 F. C. Honnold, the district representative of the Fuel Administration in Illinois, discovered that coal was being hauled into coal mining towns from other camps. In conjunction with the State Fuel Administrator this practice was prohibited and local communities were compelled to use their own coal, hauled by truck direct from the mine. An increase in production was thus obtained and precious railroad transportation was saved. According to the Geological Survey, 21,890,000 net tons of coal, or nearly 3.5 per cent of the total production, was sold locally or used by employees and not loaded into railroad cars, nor coked or consumed as mine fuel.

Motor Trucks as Open-Top Equipment Offer Possibilities

WE are told on good authority that the shortage of open-top equipment on the railroads will continue for several years. Why not push the use of open-top equipment that does not travel on steel rails? The opportunity obviously is limited but nevertheless it is of large proportions. Production now moves in the United States over 15,000 miles of canals and inland waterways, 250,000 miles of railways, 2,753,334 miles of highways, according to a statement by George M. Graham, general sales manager, Pierce-Arrow Motor Car Co., at the Increased Production Convention of the United States Chamber of Commerce at Atlantic City last week.

Ships, railroads and motor trucks, Mr. Graham holds, constitute the great transportation trinity which distribute production, each having an equally important place in the general transportation scheme. This authority sums up the relation of all three factors in respect to production as: First, our waterways are determined by nature's laws; for transportation with the outer world the merchant marine is supreme; second, the steel rail has ever been the herald of development, but locomotives and cars cannot travel beyond its bounds; third, the highways offer an infinite possibility of communication with points not to be reached by railway or ship.

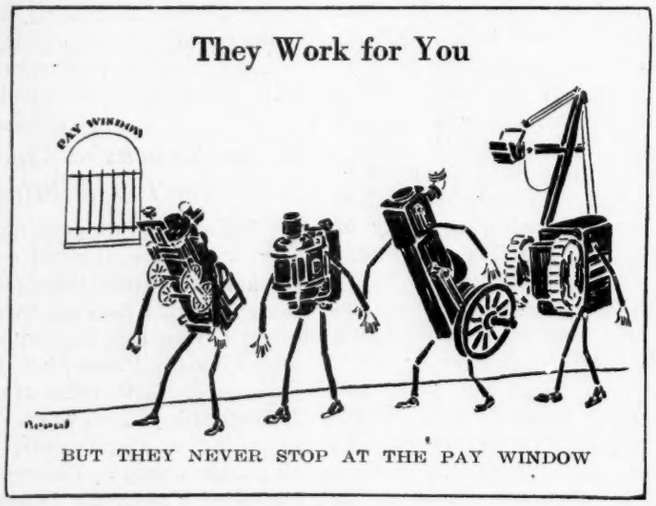
Increasing production rests largely on the development of highway transportation. It is estimated that on the Great Lakes and the Mississippi in 1918 90,000,000 tons of freight were carried. In the same year 1,200,000,000 tons were moved by motor truck, and 2,504,000,000 by rail. Much of this motor truck tonnage was haulage to railroad freight stations. Highways have fallen short of carrying their share because it is only within the last decade that a proper medium has been developed. Temporarily our railroads have reached the limit of their capacity. They can have no greater volume. *Railway Age* says they need 712,400 more freight cars, and only 300,000 can be built yearly. There is an estimated shortage of 50 per cent in locomotives. Five years is suggested as the minimum time in which railroad facilities can be brought to normal.

The railroad officials are at this time naturally more anxious than ever to meet the demands upon them, according to George F. Post, chairman of the Railroad committee of the United States Chamber of Commerce. Even if they had the money now, which they have not,

it would be some time before they could add substantially to their equipment. Some of the strong roads have already contracted for new cars and locomotives, but not for more than half of what they need, because of the restricted market and high cost for borrowings.

Conservatism in Regard to Machinery

CONSIDERING that to the operator coal is reasonably cheap, not being loaded down with heavy transportation charges, it seems strange how many there are in the coal industry who have shown little willingness to accept mechanical development. Much of the work around some tipples continues to be done uncertainly and inefficiently by gravity, "beef and brawn." Take for instance, the infrequent use of the coal haul. In many cases there is fall enough to bring the cars to the tipple, and all that is necessary is to lift a brake or remove a sprag and cars will run into the dump. But the use of gravity usually wastes much labor and time because of the necessity of going back for cars or having some one stationed to let the cars into the tipple. This also slows down dumping considerably.



But this is the least of its shortcomings, for the loss of elevation at the cross-over dump and the long, steady downgrade on the load tracks, with the further loss of elevation in the empty pit, puts the lowest point in that pit several feet below the elevation of the switch where empty and load tracks join. Consequently the empties have to be hauled up an unreasonably steep grade that limits the number of cars that the locomotive can start from the pit bottom.

In consequence the locomotive in starting toward the mine is heavily handicapped, and the length of trip both for loads and empties is cut down unless the grade on the main track is exceptionally heavy. Moreover, the necessity for getting a suitable grade for the loads on the load track will, in most cases, cause either undue steepness or undue flatness in the main track, both of which are undesirable.

One meets with places where to adjust the grade for the delivery of loads by gravity to the tipple the grade of the main track has been made level or unduly flat, and other cases less frequent where it has been made excessively steep. Had a car haul been introduced the grade on the main track from the empty switch to the drift mouth might have been made nearer the ideal, which is about six-tenths of one per cent, this being the grade which provides from the locomotive an equal tractive effort for loads and empties. Furthermore, the cars would have been saved from much deterioration, for many are the bolt holes that are enlarged by the bumping which the cars receive in the empty pit.

The car haul is part of the natural order of things, a mechanical aid to dumping almost as essential as the cross-over or the rotary dump, and its installation should not be avoided on the plea that it can be dispensed with.

Below the tipple it seems essential that the railroad cars should not rely on gravity, which is either inadequate in cold weather or only too greatly accelerating in warmer seasons. Gravity is at the mercy of snow or rain One day the cars move too easily, another they respond with difficulty to the pinch bar, the trimmer's shoulder or to the jolting he gives by jumping on the car end. Speaking loosely, the response of gravity is slow and uncertain because the resistance of standing bodies is so much greater than the resistance of those that are moving. Machinery can be arranged to be adequate, whereas gravity cannot meet successfully the change of resistance which varying conditions inevitably create. Space does not permit calling attention to the unsuccessful way in which the coal passes over pans and screens when gravity is solely relied on to provide for its movement. Stoppage and excessive speed alternate with each other and break the coal into dust.

The future will see a growing disposition on the part of the mine engineer to limit his dependence on the force of gravity and to rely on power as a more certain and controllable means of operation. The art of making gravity do the work has been pursued with such abandon that it has created almost an obsession and made us too often overlook the fact that only with machinery can a delicate adjustment be obtained such as is well typified by the steam hammer that cracks a watch crystal and leaves the delicate mechanism intact.

Tendencies Easily Discernible

THIS is the annual Equipment Number of *Coal Age*. In it an attempt has been made to describe some of the equipment that has been and is being used from day to day in the mines in order to render the production of coal easier, and more speedy and also more profitable to the operator as well as cheaper to the consumer. No effort has, however, been made to enumerate all of the devices of this nature. Any such attempt would require vastly more time and space than this or any other periodical could possibly devote to the task.

It is interesting at such times as this, however, to indulge in a short retrospect, discover what, if any, are the trends in the industry and then take a short glance at or into the future.

For many years there has been a pronounced tendency toward electrification. The last year has been no exception to the rule established by its predecessors and has witnessed the alteration of many coal plants from steam to electric energy. This change has possibly not been quite as rapid during the twelve months past as it has been during some similar periods in the past. This unquestionably arises from the constantly rising prices with which the last year has been afflicted. While accomplishment has been admittedly slow, the direction

of the movement has been none the less pronounced.

For many years also there has existed a steady movement away from all forms of animal haulage toward mechanical haulage, usually in the form of electric locomotives, either storage-battery or trolley. The last year has seen no change from this course. The problem of tonnage movement in a coal mine is an extremely vital one on account of the vastness of the production. Mechanical haulage is not only cheaper than animal in most cases but what is, in the majority of instances, much more important, it is more reliable.

The electrically driven centrifugal pumps for installation both above and below ground appears to be gaining in favor. The old objection to these machines for use in the mines, namely, that foreign substances such as chips, small pieces of coal, rocks, slate and the like were liable to lodge in the impellers and thus not only cut down the efficiency but throw the machine out of balance, seems in large measure to have lost its force. This is doubtless due in part to improved design and in part to greater care in installation. In this connection it should in truth be said that the electrically driven multiplex plunger pump is running the centrifugal machine a close second in popularity for use underground.

Rotary dumping and skip hoisting have made great strides in the recent past. Some of the largest shaft mines in the world are now fitted with these devices. Wherever extreme outputs are necessary the skip takes the place of the multiple-decked cage, saving time at both top and bottom while introducing no caging problem whatever. It furthermore permits continuous dumping and lessens both the rope speed and the power consumed as compared with the usual single-decked cage. Probably the most vexing problem with which the coal operator has to deal is that of labor. The greatest labor problem of the mine is that of loading the coal into the mine car. A successful mechanical loader thus presents the greatest improvement that could possibly be made in the process of coal production. In the past many devices have been tried with more or less success, but there are now on the market several machines, that have become articles of commerce, that will load cars successfully. As a rule, however, they have not yet attained the preeminence and universal adoption that either their inventors or the rank and file of operators might wish and for which all sincerely hope in the future.

Of all the many reasons for this lack of general adoption, two stand out prominently. First, most of these machines are large, therefore heavy, and consequent upon this their cost is not only high but they must secure a high rate of production in order to show a saving over present methods. This immediately introduces a factor, foreign to the machine itself but highly pertinent thereto—namely, keeping the machine supplied with cars. This has been partially solved in some models by a storage device on the machine itself.

The second shortcoming of any and all mechanical loaders lies in the fact that no machine, be it ever so skillfully designed and constructed, can be made to think. It will as a consequence pick up and load a piece of slate or rock as readily and quickly as it will a lump of coal. Of course this is by no means insurmountable. It, however, transfers the problem of slate removal from the working face to the tipple—from where it belongs to where it does not belong. This in turn introduces a rock-disposal problem that should be avoided if possible.

What is apparently wanted is a comparatively light machine, one that one or at most two men can handle and operate, the movements of which one man can control with ease and precision. The trend of invention along this line is in the right direction.

MACHINERY (SPEAKING): *"Durned Hard Work, Isn't It? Let Me Take a Hand."*

Trucks Relieve the Coal Shortage

COAL has determined the location of many modern cities. Some of the larger metropolises have centered about points where transportation by rail and by water brought large congeries of people and created accordingly many prosperous industries. Such cities are New York, Chicago, Boston, Buffalo, Cleveland, Seattle, Tacoma, San Francisco and New Orleans. But other cities have built themselves upon the basis of both transportation and coal. Such cities are Pittsburgh, St. Louis, East St. Louis, Birmingham, Cincinnati, Columbus, Terre Haute, They grew great first because of communication facilities, second, because of cheap coal and thirdly because the availability of coal made railroads through them important. These cities are so near the railroads that they can receive coal by truck. Their industries need not be paralyzed by a railroad strike if only the ship-by-truck possibilities are used as they were in Great Britain during the great strike of her railroad systems. It is stated that most of the coal now received in that central ganglion of the United States—St. Louis, East St. Louis, Venice and Granite City—is coming in by interurban railway service and by truck. True, about 20,000 men in the southern Illinois fields are idle, but much of the idleness in St. Clair, Madison and other counties could be cured if truck service to St. Louis and the river at that port were properly organized.

Designing an Electric Hoist to Meet Needs of a Long Mine Slope

Rapid Increase in Speed and Prompt Slowing Down Are Not so Necessary in a Slope as in a Shaft Hoist—Special Arrangement Provided for Passing Slowly Over Long Curve—Strange Rhythmic Pulsation in Current Is Noted

BY GRAHAM BRIGHT
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MUCH that has been written on the subject of hoisting systems for coal mines has dealt particularly with the vertical type of hoist. As the vertical hoist involves short cycles with short acceleration and retardation periods, the capacity of the equipment in many cases is largely determined by these periods. The large slope hoist, however, must meet a different set of conditions. The accelerating and restarting periods can then be readily lengthened, but they have little influence in determining the capacity of the equipment. A study of the operating conditions under which a hoist of this nature was recently installed at the Footdale mine of the H. C. Frick Coke Co. illustrates this point.

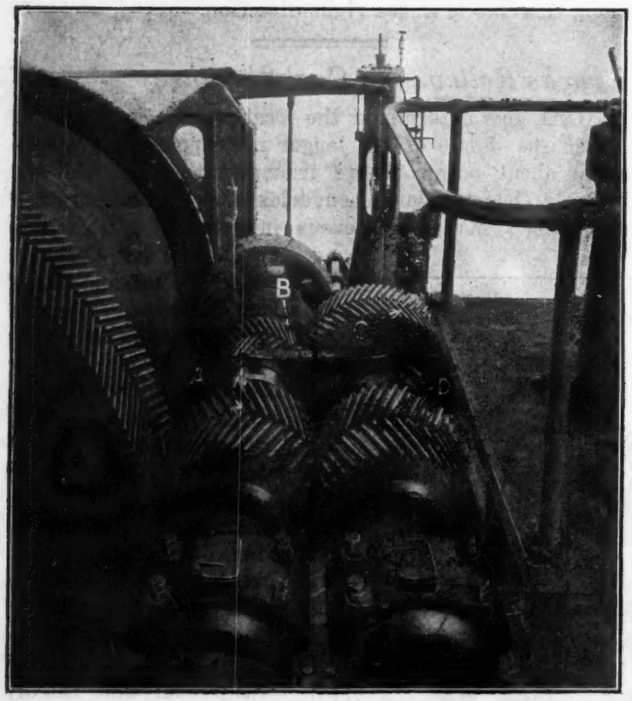


FIG. 1. BACK GEARS AND CLUTCH

The hoist may be driven at full speed through pinion *A* or at half speed through all the small gears shown, pinion *A* then operating as an idler.

The service data upon which this hoisting equipment was designed are shown in Table I. The hoist consists of a single cylindrical drum 9 ft. in diameter, having an ultimate capacity of about 13,000 ft. of 1¼-in. cable. This drum is geared to an 800-hp., 2,200-volt, three-phase, 60-cycle, 24-pole, pedestal-type, wound rotor, induction motor. This motor is controlled by a magnetic type of controller which is full automatic and is operated by means of a small master controller located on the hoist platform. The main control and incoming line panel are placed in a separate room. The primary reversing switches are of a new type, designed for a maximum potential of 6,600 volts and a capacity of 500 amp.

Part of the coal to be hoisted is obtained from a level about half way down the slope and known as the River or Heading Road. It is here necessary to start the loaded trip slowly around a sharp curve until all the cars are on the straight track, when acceleration to full speed can take place. Equipment to safely accomplish this result with a low expenditure of power has been worked out and furnished by the Vulcan Iron Works. This device, shown in Fig. 1, consists of two sets of herringbone gears, so arranged that by means of air-operated clutches either full speed or half speed can be obtained on the main drum.

TABLE I. SERVICE CONDITIONS UNDER WHICH HOIST WAS DESIGNED.

Total length of haul.... 4,225 ft.	Maximum rope speed 1,500 ft. per min.
First 200 ft. is on 6 per cent grade	Maximum weight of loaded car 6,500 lb.
Next 1,975 ft. is on 6.6 per cent grade	Maximum weight of empty car, 2,500 lb
Next 1,750 ft. is on 6.2 per cent grade	No. of cars per trip.....5
Last 300 ft. is on 4 per cent grade	No. trips per 8-hr. day..... 25

This gear and clutch arrangement is quite simple, its operation (see Fig. 1) being as follows: For full-speed operation the pinion *A* drives the hoist gear directly, while the pinion *D* on the auxiliary shaft runs free. When half speed is desired, pinion *A* is allowed to run free on its shaft, and the drive is made through pinion *B* to gear *C* and from pinion *D* to the hoist gear, pinion *A* acting as an idler.

The power necessary to pull the trip around the

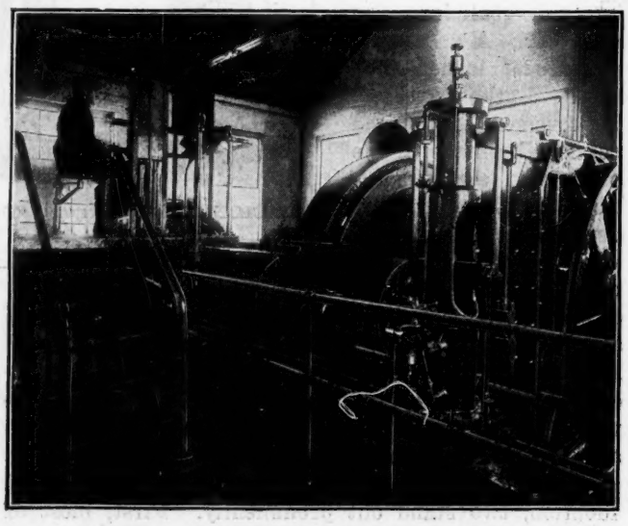


FIG. 2. FRONT VIEW OF THE HOIST

This view shows the brake and the device for preventing operation when the brake becomes worn.

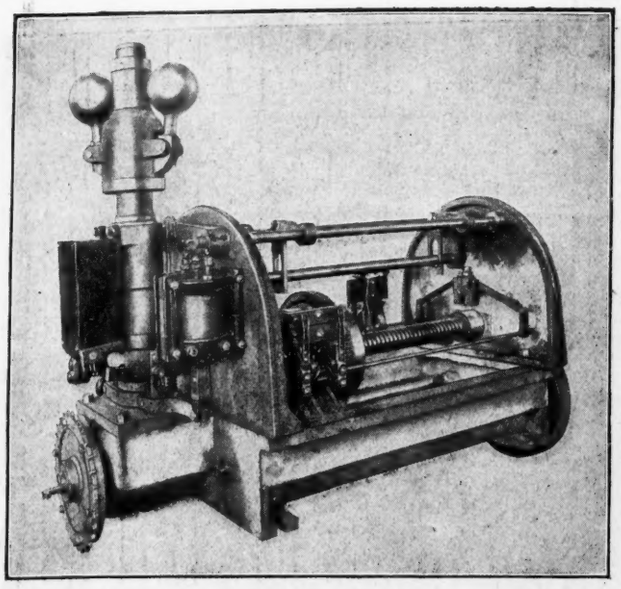


FIG. 3. SAFETY SPEED AND OVERWIND GOVERNOR
This device also embodies a mechanism for graduating the brake release.

curve is thus halved. This greatly reduces the demand upon the electrical system, and in turn decreases the power bill by cutting down the maximum demand peak. Unless full capacity is required, such a hoist as this can be operated continuously at the reduced speed with a large saving in the power bill.

The trip is delivered at the ground surface, where it is taken care of by a storage-battery locomotive that switches the cars to a slow-moving, continuous type of incline hoist. This hoist delivers the cars one at a time at the top of the tipple, where the coal is dumped.

The hoist lets the trip of empty cars down the main slope at the same speed that the loads were brought up. In order to keep the hoist motor from attempting to push on the rope, the trip of empty cars is allowed to come up to speed by gravity, but when the speed meter shows that the drum is revolving at 300 r.p.m. the control is moved quickly to the full "on" position, driving the hoist in the direction in which it is already running. The speed will increase to slightly above synchronism, at which point the motor holds it constant and returns a small amount of energy to the power system. This method prevents any tendency to overspeed during lowering, increases the cooling of the motor on account of fairly high-speed operation at light load, and saves wear and tear on the brake system.

In Fig. 4 may be seen the flexible coupling and safety device. This view illustrates the value of the pedestal type of bearing for a large hoist motor. Fig. 5 is a view of the hoist from the opposite side and illustrates in detail the type of wiring around the hoist platform. All main and control conductors are installed in conduit, large sizes being necessary because the insulation of all control wiring was specified for 2,500 volts. This view also shows the small magneto generator belted to the motor shaft and connected to one of the meters on the hoist platform and calibrated in r.p.m. It also shows the master controller, emergency switch and air-brake handle on the hoist platform, in addition the dial indicating the location of the trip will be noted. The large index rotates three times during the complete trip, so that the exact position of the trip can be noted from the position of the small pointer on the dial.

The hoist platform is provided with meters which at all times indicate the current and speed of the hoist,

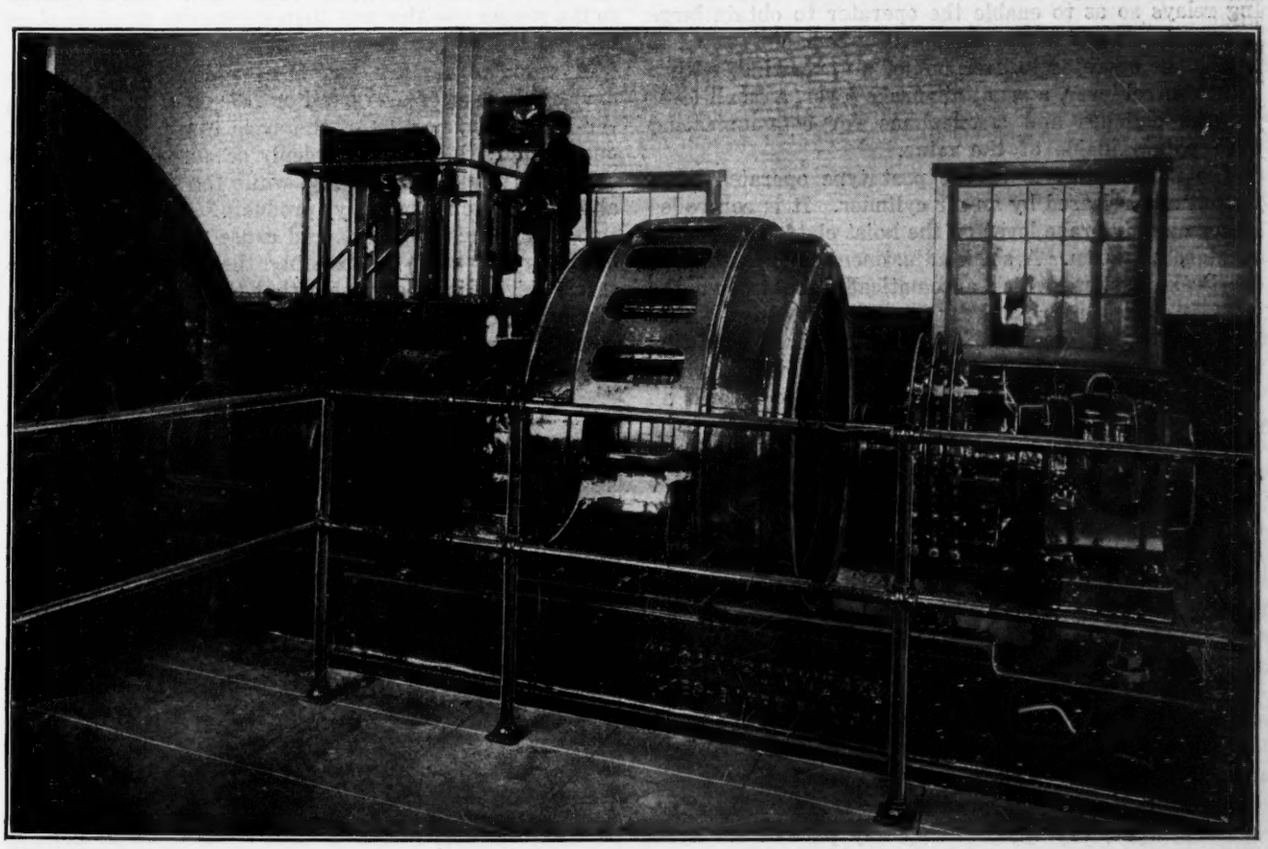


FIG. 4. FRONT VIEW OF THE DRIVING MOTOR AND OPERATOR'S PLATFORM
Note the flexible coupling placed between the motor and pinion shafts and the sturdy construction of the entire machine.

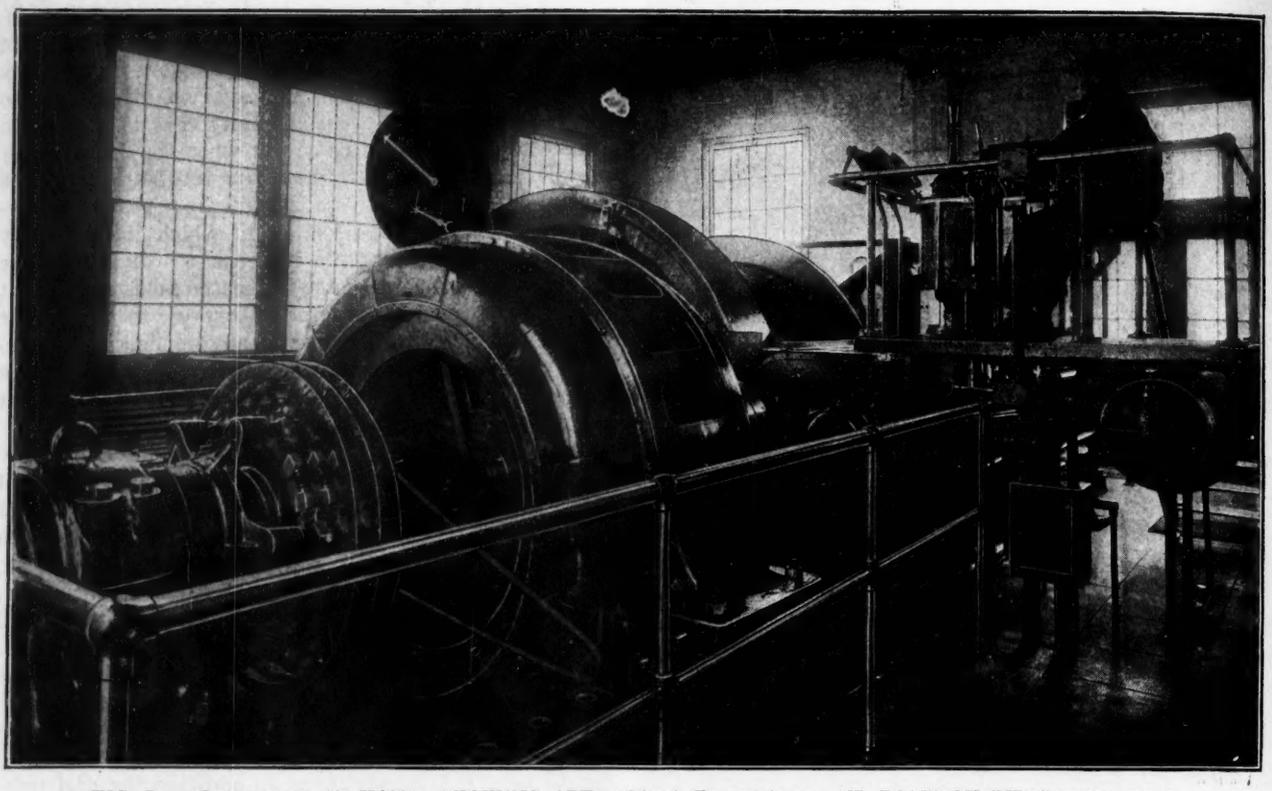


FIG. 5. MOTOR END OF HOIST, SHOWING OPERATOR'S PLATFORM AND POSITION-INDICATING DIAL
This view also shows a magneto belted to the hoist shaft. This machine is connected to a meter on the operator's platform and is calibrated in revolutions per minute.

with a safety switch to open the oil circuit breaker and stop the hoist in case of emergency, with a maximum-torque push button to cut out the automatic accelerating relays so as to enable the operator to obtain large torques in case of emergency, with a back-out switch to enable the operator to back out of an overwind, with a main control lever, a small air-brake lever, a small lever for the clutches and a telephone for communicating with points inside of the mine.

The main brake is of the post type operated by a weight and released by an air cylinder. It is controlled by a small air-brake lever on the hoist platform through a cataract system. A slack adjustment is furnished on the brake system, which automatically shuts down the hoist in case the brake wear becomes excessive. This insures the brake system being in first-class condition at all times. A Webb-type recorder is provided, which gives a graphic record of each trip and also records all signals. Fig. 2 illustrates the mechanical parts of the hoist and shows the type of brake system, including the countershaft brake, the bedplate for the motor and the hoist platform. In this figure also can be seen the brake magnet, cataract system, device for taking care of brake wear, the rear of the back-out switch and the telephone.

An auxiliary band brake is furnished on the pinion shaft. This operates in conjunction with the main brake and can be so adjusted that it takes care of the inertia effect of the motor rotor, thus relieving the main brakes and gears from unnecessary stress and wear.

The safety device furnished by the Vulcan Iron Works consists of a fly-ball type of governor and a traveling-nut type of overwinding device. This apparatus prevents overspeed during any part of the cycle and will shut off the power supply and apply the brakes if the hoist operator does not retard the trip at the proper time. In case of overwind the power is cut off and the brakes applied. It is not possible to operate the hoist again until the back-out switch is thrown to the proper position and then movement can take place only in the proper direction.

A valuable feature has been added to this safety device. In case of overspeed or failure of power during the high-speed portion of the cycle it would be dangerous to apply the brakes suddenly because in such a case the hoist would stop quickly, while the trip would drift ahead and stop gradually, producing slack cable. The trip would then run back and cause serious damage by breaking the cable or bending the drum shaft. The safety device is so arranged that the brakes are gradually applied at any but the overwind position, in which case they are applied promptly.

Fig. 3 illustrates the safety device and shows the

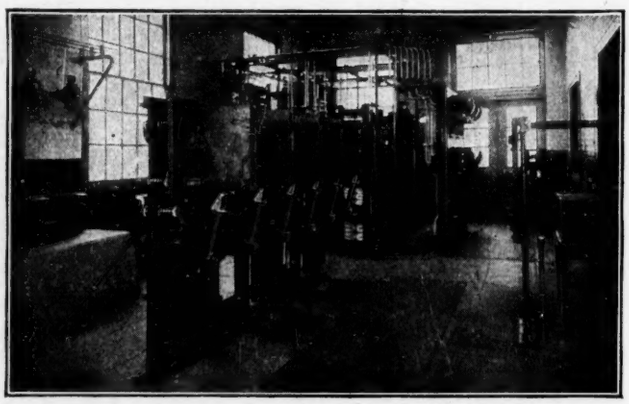
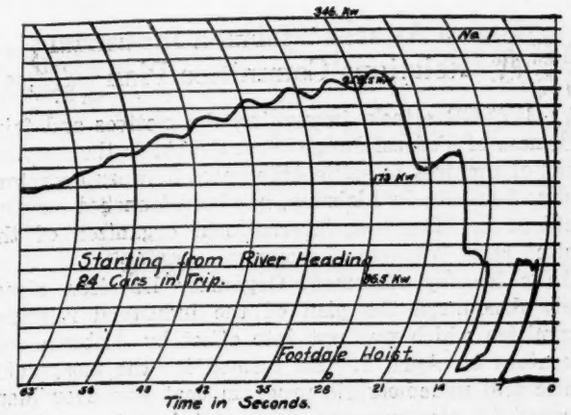
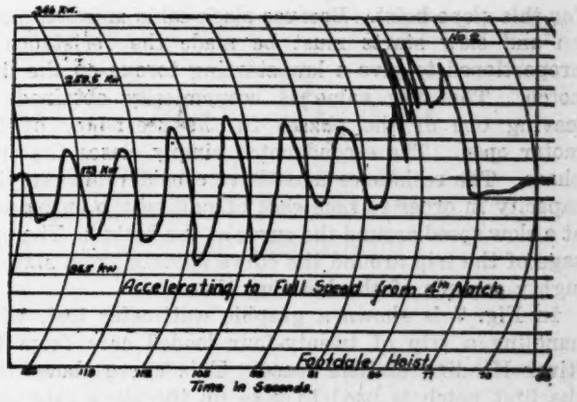
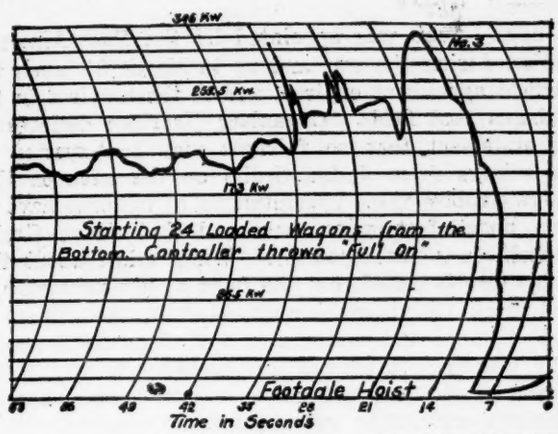


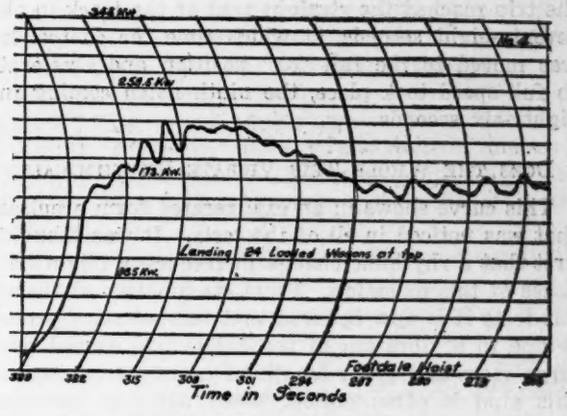
FIG. 6. CIRCUIT BREAKER AND SWITCHBOARD PANELS
The switches are designed for a maximum potential of 6,600 volts. They are arranged in groups of two each and sometimes operate several times per minute.





FIGS. 7 and 8. GRAPHIC WATTMETER RECORD OF HAULING CARS FROM RIVER HEADING
The start was begun at half speed and after straight track was reached the hoist was continued at full speed.





FIGS. 9 AND 10. RECORD OF HOISTING 24 LOADED CARS FROM THE BOTTOM
In thi s case the cars were pulled around the curve onto the straight track and there stopped. The controller was then thrown to the full "on" position and the record here showns made.

solenoid on the end next to the governor for the purpose of half-speed operation. In addition the overwind switches and the device for graduating the brake release according to the position of the trip can be seen.

The various safety devices on this hoist provide the following features:

(1) The hoist cannot over-travel in either direction.

(2) It is impossible for the hoist operator to start the machine in the wrong direction at either limit of travel.

(3) Protection is provided against overspeed arising from any cause whatever during any part of the cycle.

(4) Excessive peaks cannot be imposed on the power system because of careless handling of the controller. The power input to the hoist is held below certain predetermined limits through the use of automatic relays in the control system.

(5) Power will be interrupted and the brakes applied if the operator fails to retard the hoist at the proper time.

(6) The hoist cannot be started upon return of power or after the safety devices have acted until the operator has returned the control lever to the "off" position.

(7) If the operator fails to keep the brake system in proper adjustment, power will be interrupted and the brakes applied, and further operation cannot take place until proper adjustments have been made.

(8) There will be no delay in operation because of the functioning of any of the safety features. It will not be necessary for the operator to call for assistance in case of an emergency stop, over-travel or other contingency.

(9) Operation of the safety devices does not cause a movement of any of the levers on the hoist platform, that may endanger the operator.

(10) No safety feature depends upon the will of the operator.

(11) All electrical safety devices depend upon opening of electric circuits, not the closing of them.

(12) A safety switch is provided on the hoist platform to enable the operator to stop the machine at any time.

(13) The various safety devices give the operator complete confidence in his ability to control the hoist, thereby permitting him to run to its greatest output.

Fig. 6 shows the high-tension primary switches in the foreground. These switches are designed for a maximum voltage of 6,600 and a current capacity of 500 amp. They sometimes operate several times during each cycle, and are much superior to any oil-immersed switch for such service. They are operated in three groups of two each. The individual switches are mounted on heavy channel iron frames and have porcelain insulators. Magnetic blow-outs and divided arc chutes are provided to protect the operator in opening heavy currents at high voltage.

A number of graphic wattmeter tests have been made with the hoist operating at half speed, the substation as yet not having sufficient capacity for full-speed operation. These tests show clearly the various resistance steps and illustrate the low starting torque necessary

for this slope hoist. Because slack cable must be taken up and slow starts must be made the resistance is proportioned to give a low starting torque on the first notch. This low value is economically obtained by leaving one of the phases in the secondary of the motor open. The second notch simply closes the open phase. The resistance must have considerable carrying capacity in order to take care of pulling the entire trip at a slow speed around the curve at the bottom. The passage of the trip around the curve absorbs from sixty to eighty seconds of the hoisting time.

In Fig. 7 is shown a graphic wattmeter test, when handling a trip of twenty-four loaded cars from the River Heading at half speed. This curve shows that the first notch is used to take up the slack cable and then three more notches are employed to pull the trip slowly around the curve to the straight track. The finish of this haul is shown in Fig. 8, indicating that the trip reached the straight part of the track in about seventy-eight seconds, at which time the control lever was moved to the full "on" position and acceleration to full speed took place, the ninth notch coming in at eighty-six seconds.

Does the Whole Trip Vibrate Rhythmically?

This curve shows in an exaggerated form a pulsation that was noticed in all of the tests. It was thought at first that a rhythmic change in frequency might be the cause of this pulsation. From examination of the various tests it is now believed that the pulsation probably is due to a vibration of the entire trip caused by the large mass and great length of cable. A vibration of this kind is often noticed when using a first-motion steam engine, due to the pulsating tractive effort of the engine itself. In most of the other tests the vibration was much smaller.

The results of starting a trip from the bottom after it had been pulled around the curve into the straight track and there stopped is shown in Fig. 9. The controller was moved to the full "on" position from rest. The illustration shows that the first four notches came in promptly, after which the accelerating relays took care of the following notches. The last notch indicates that slightly too much resistance is cut out, and this can be readily adjusted. The same rhythmic vibration takes place as shown in Fig. 7, but to a much smaller degree. The time element is a little larger, probably because of the greater distance from the top.

In Fig. 10 is shown the finish of the trip started in Fig. 9. The time interval of vibration is lessened considerably because of the shorter length of cable. Tests of this kind show clearly the effect of varying grades and curves and provide a valuable check on the capacity of the electrical equipment.

The ultimate duty of this hoist will consist of lowering the loaded trips about 13,000 ft. to a point where the cars will be transported by rail to the Monongahela River, at which point the coal will be dumped into barges for river transportation to the large byproduct coke plant at Clairton.

Morrow Makes Mid-West Circuit

J. D. A. Morrow, managing director of the National Coal Association, is attending this week's meetings of operators at Terre Haute, Ind.; Evansville, Ind.; St. Louis, Mo., and Louisville, Ky.

Union Attacks Alabama Industrial Relations Committee Plan

A BITTER attack, impugning the motives and fairness of Federal Judge W. I. Grubb, in the appointment of umpires to settle differences between operators and coal miners in Alabama, has been launched here by William L. Harrison, international organizer of the United Mine Workers of America.

In a lengthy statement Organizer Harrison vigorously denounced the plan of the industrial relations committee which was put into effect by Alabama coal operators on April 1. He termed it "the most autocratic and undemocratic program that was ever inaugurated by employers to stamp out in this country a legitimate trade-union movement and to make impossible collective bargaining between employees and employers."

Judge Grubb was appointed by the Fuel Administration during the war and up to March 31 when the Garfield agreement expired, named the umpires in the Alabama coal fields. Organizer Harrison declares in his statement that no fairness may be expected by the miners from Judge Grubb on the grounds that Judge Grubb's three appointments of umpires have all been unsatisfactory to them and that Judge Grubb, himself, is a coal operator. When asked about this Judge Grubb stated that the facts of his ownership of coal stock had been communicated to the miners in each instance and that the miners, themselves, specifically waived such alleged incompetency to act. Judge Grubb, under the provisions of the new industrial relations committee, will appoint the umpires who, in disputed cases, will have the last word.

Organizer Harrison also brings out the long-standing fight in Alabama between operators and miners over recognition of the union. The miners want the union recognized, as a union, and demand that any settlement made to be in the form of a contract drawn up jointly by operators and unions in which the union shall be recognized.

Harrison Raises Six Points Against Grubb

Mr. Harrison objected to the plan on the following specific grounds:

1. That the proposal is patterned after the Rockefeller plan in operation in Colorado with the exception that the Rockefeller plan grants the right to organize "for protection" and this is denied in Alabama. 2. That there is no provision for a joint meeting of miners and operators as provided by the report of the Bituminous Coal Commission. 3. That the proposition is designed to destroy the United Mine Workers of America in Alabama and prevent the men from organizing. 4. That the increase in wages granted is not in accord with the recommendations of the coal commission in that day labor was increased only 69c. per day in the case of drivers and 60c. per day for tipplemen, instead of $1 per day for both. 5. That the election of representatives of the mine workers on the industrial committee will be completely under the influence or domination of the superintendents and foremen of the representative mines. 6. That Judge W. I. Grubb, of the federal court, is not satisfactory to the miners as the man to name the umpire who will finally settle all disputes that may occur hereafter between the mine workers and operating companies.

Gathering Locomotive with New Features To Lengthen Life and Save Power

Electric Braking, an Outside Frame with High Track Clearance, Leaf-Type Springs, an Improved Cable Reel and Demountable Tires Are the Chief New Features Embodied in the Construction of This Machine

By John Liston
Schenectady, N. Y.

THE new type of gathering locomotive here described and illustrated combines in a single two-motor unit five new features, all of which have successfully withstood such severe and long-continued tests in practical coal-mine service as to demonstrate fully their general utility.

By means of a new type of controller positive and graduated electric braking is secured. Heretofore much more effort has been expended in operating the brakes in gathering work than in handling heavy haulage locomotives. The haulage locomotive, as a rule, starts from some given point and stops only when it reaches the tipple or shaft bottom, a considerable distance away. En route there are few if any stops, and the motorman is therefore seldom required to operate the brakes on the way.

In gathering work the locomotive ordinarily starts and stops many times while the switches at the room necks are thrown and while couplings are made to each car individually. Consequently, while the gathering locomotive is lighter than the main-haulage machine the sum total of braking effort expanded by the motorman is considerably greater.

The new controller was designed with a view to relieving the motorman of a large part of this braking and it operates so that the locomotive is stopped by its own momentum. This is accomplished by providing on the controller reverse cylinder a set of connections that turn the motors into self-excited generators, and the energy developed by them is absorbed in the main resistors. The amount of this energy, and consequently the degree of braking effort, is governed by the main cylinder of the controller. The more the resistance that is cut out of circuit, the more quickly will the stop be made.

The reverse cylinder of the controller is provided with four points, two for each direction of motion. For the first of these points the motors are connected in the regular motoring position. When it is desired to stop, the main cylinder is thrown off in the usual way and the reverse cylinder is through to the second, or braking point. The main cylinder is then turned on again and

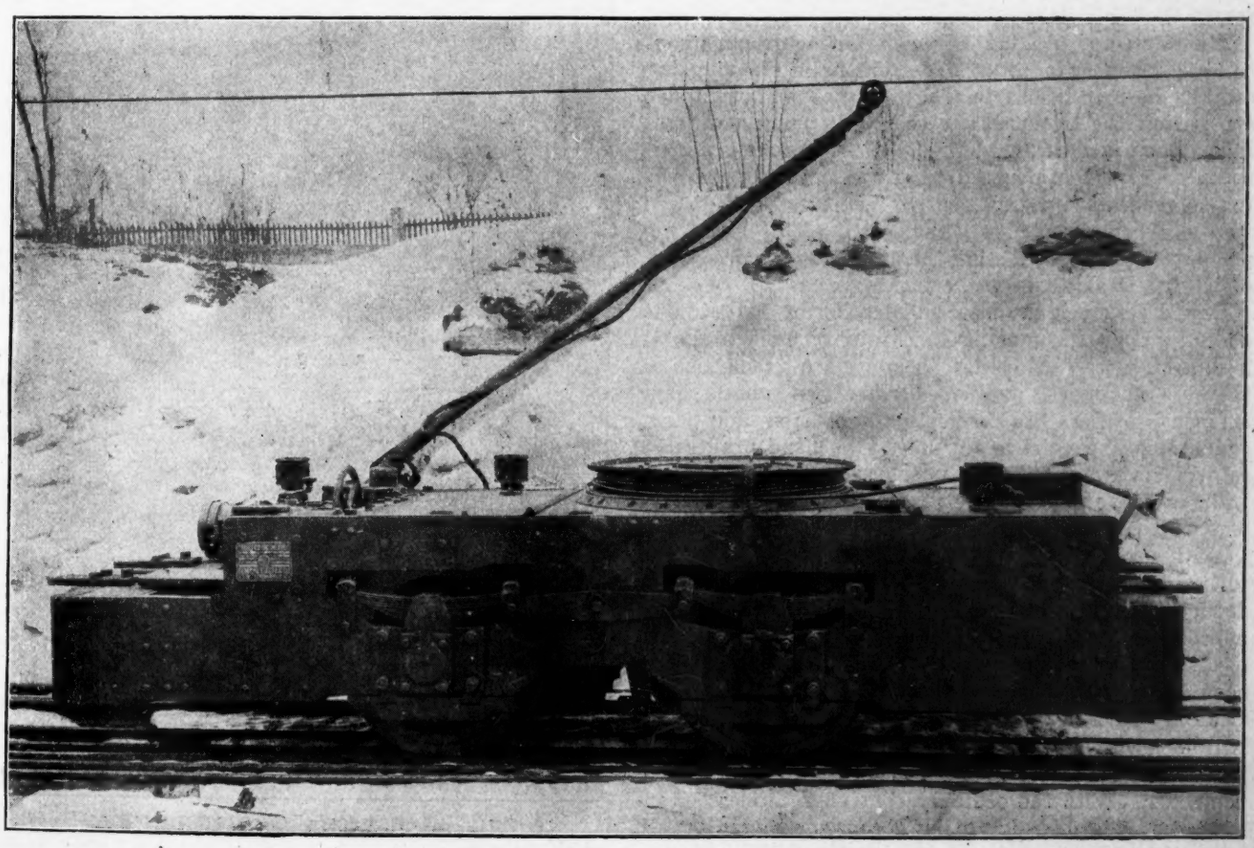


FIG. 1. SIDE VIEW OF THE NEW LOCOMOTIVE
Note high rail clearance, equalized suspension of leaf springs withaccessibility of brake-adjusting mechanism.

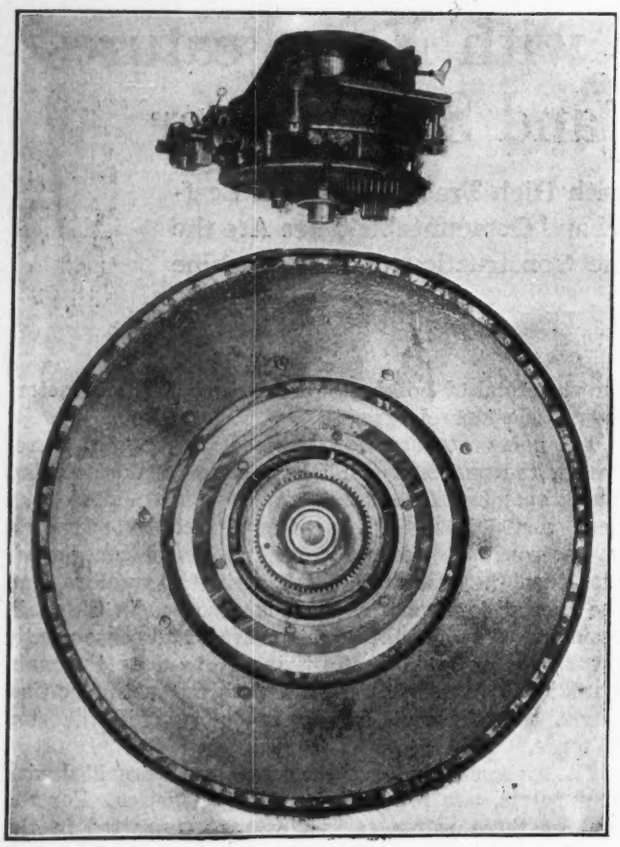


FIG. 2. REEL MOTOR AND BOTTOM OF CABLE REEL
The large size of the supporting ball bearing is one of the improvements in reel design.

the motors (or generators, as they now are) begin to retard the locomotive.

The degree of braking is under the motorman's control at all times, for if he finds that he is stopping too quickly, he merely has to throw off the main cylinder and permit the locomotive to coast. In numerous tests it has been demonstrated that with the trolley disconnected the residual magnetism of the motors, when acting as generators, is sufficient to insure as quick a trip stop as when the trolley is connected. This is an important factor in estimating the all-around serviceability of electric braking in gathering work.

On a level track the motorman can bring his train to a dead stop without using the ordinary hand brake at all. He also can bring it to a stop on a grade, but as there is no energy developed when the wheels have stopped turning, the locomotive will stop and start again, stop and start again unless the hand brakes are set. A runaway, however, is impossible so long as the train weight and grade are within the braking capacity of the locomotive.

With electric braking, therefore, the hand brakes need to be used very little, and as a result there is a great reduction in the wear on brake shoes and wheel treads as compared with hand braking. Furthermore, with electric braking, since the retarding effect is zero as soon as the wheels have stopped rotating, there is practically no skidding of the wheels, and consequently there will be few, if any, flat spots developed from this cause.

There is another incidental benefit with this type of controller. With the ordinary controller careless or indifferent motormen do not always use the hand brakes when they want to stop. In many mines it is a rather too frequent practice for the motorman to save effort by reversing the motors when a stop is to be made. When stopped in this way, the motors sustain a heavy rush of current and the gearing and other parts of the mechanical equipment receive severe shocks, all of which tend to shorten the life of the various parts and run up the maintenance costs.

This controller is different in another way from that employed upon the ordinary mine locomotive. Most controllers at present are arranged so that the locomotive will start with the motors either in series or in parallel. Here again the indifferent motorman will not use the series position when running slow. Instead he will leave the reverse cylinder in the parallel position and get slow speed by running on resistance. This increases maintenance costs of resistors and while on slow speed consumes twice as much current as if the motors were in series.

This question of additional current consumption may not in many cases represent a serious economic loss when one locomotive only is considered, but when a number of gathering machines are used the total amount of energy wasted in this way in a year is always a matter of serious consideration to the mine engineer who is desirous of maintaining a high over-all efficiency for the electric system of the mine.

The electric braking controller is a positive insurance against this particular form of waste as it is of the series-parallel type similar to that used on the ordinary street car and the first point is always "series-motors." Consequently the motorman cannot get to parallel operation until he has gone through all the series points.

In Fig. 4 the controller is shown with the arc chutes

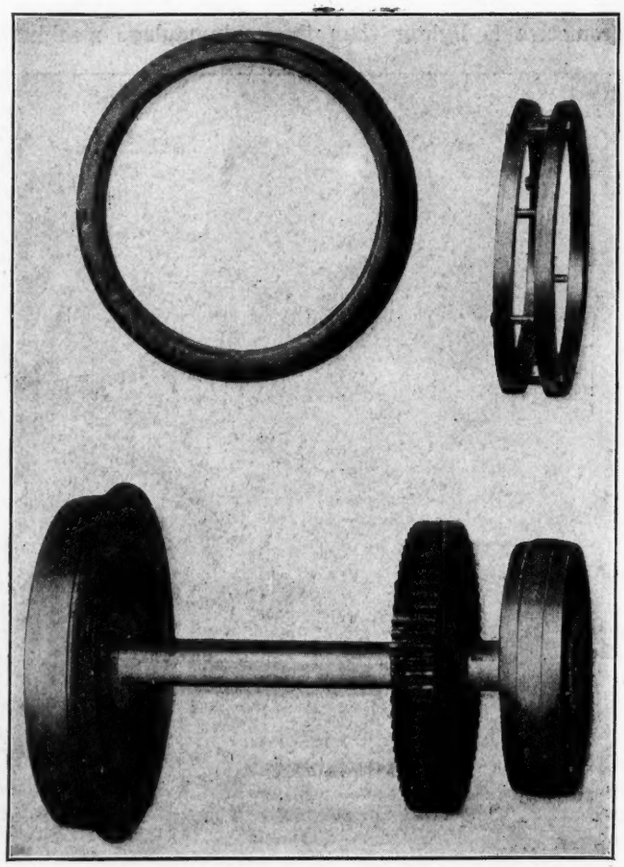
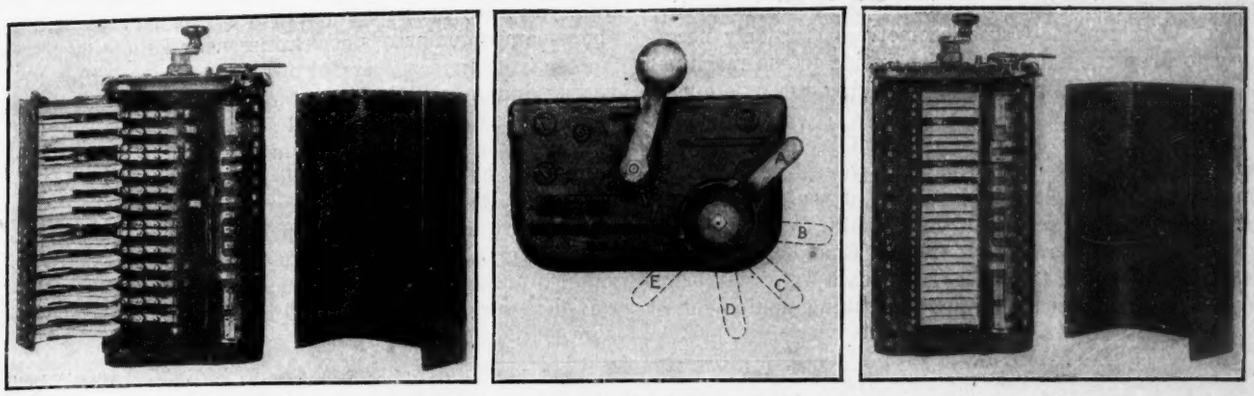


FIG. 3. DETACHABLE TIRE DRIVER
Tread is not shrunk on but held in place by two V'd rings drawn tight with bolts. Two men with wrenches can replace a worn tire in fifteen minutes ready for immediate service.



FIGS. 4, 5 AND 6. SOME DETAILS OF THE CONTROLLER

The construction of this controller is radically different from that of the ordinary type. The reverse cylinder is provided with four operating points and a neutral, and the arc-chute apertures are comparatively restricted.

in normal operating position. It will be noted that the apertures are greatly restricted as compared with ordinary controller construction. This arrangement was adopted after exhaustive tests had demonstrated that by this means the arc could be extinguished in about one-third of the time required with the more open form of arc chute.

This detail insures longer life for the contacts since for all practical purposes their length of service is inversely proportional to the time of duration of the arc.

The outside frame construction adopted for the new locomotive is decidedly substantial. The side frames are cut from solid rolled steel plates, while the end frames are built up from structural steel channels, rolled slabs and wood bumpers protected by heavy face plates.

The outside frame in this case differs from the usual machine of this type in that the clearance between the rail head and lower edge of the side frame is high. Ordinarily an outside-frame machine would clear the rail head at this point by 3 or 4 in. When the locomotive is derailed, the frame settles down to about the level of the rails and prevents all access to the wheels. With this new construction the high clearance of the frame permits access to the lower part of the wheel so that blocking or other re-railing devices may be put into position, and the locomotive gotten back on the track practically as quickly as if the wheels were outside of the frame.

Outside Frames Mechanically Advantageous

There are, of course, some mines where side clearance will not permit the extra width of the outside-frame type machine, but as a rule the main objection to this type of construction has been the difficulty of getting it back on the track in case of derailment. The high-clearance feature should remove this objection.

On the other hand, the outside-frame construction permits the use of a better journal box, one that is entirely inclosed at one end, while the other end can be fitted with a dust guard. With an inside frame both ends of the box must be open and bearings must also be made in two halves. This is not as good construction as the closed-end box either theoretically or practically. With the outside frame the greater space between the side frames allows more room for the equipment and permits the use of a liberal amount of space for the motorman's cab.

Heretofore practically all two-motor locomotives have been equipped with the round wire-coil type of journal spring, whereas the heavier three-motor machines were provided with leaf-type springs. These insured smoother running and better distribution of the weight on the drivers when operating on rough and uneven tracks.

As the result of operating experience gained with the three-motor units, the new locomotive was provided with a semi-elliptic leaf-type spring having an equalizing bar between the two journal springs on each side. Because of the limited space in the over-all dimensions of mine locomotives, the leaf springs can be designed with a much greater margin, that is, with much less of an approach to the elastic limits of the material used, than is the case with helical spring design. Consequently the leaf springs are mechanically stronger and less liable to breakage.

Leaf Springs Permit Wheels to Accommodate Themselves to Track Inequalities

By using leaf springs and equalizers the two-motor four-wheel locomotives will accommodate themselves to inequalities in track levels for the reason that any change in wheel load is transmitted through the equalizing levers to the other wheels, thereby practically evening up the weight on the drivers. Incidentally, the equalizing lever greatly increases the range of spring action and any tendency toward derailment is thereby minimized. Finally, the improved riding qualities of the locomotive tend to reduce the wear and tear on the track and roadbed.

The cable reel on this machine is an improved form of the vertical-axis motor-driven type that has been used successfully for a number of years. No change has been made in the ball-bearing motor but the bearing mechanism of the reel itself has been modified so as to secure greater stability and better wearing qualities. Instead of a large diameter of bearing made up of a considerable number of small balls, the reel now rotates on a heavy-duty type combination thrust and step ball bearing mounted at the center of the reel disk. The double-reduction driving train is made up entirely of forged-steel gears and heat-treated pinions.

The construction of the demountable tires is extremely simple, consisting merely of two wedge-shaped steel rings drawn together at suitable intervals by bolts. In drawing these rings into position the tire is forced to take its proper alignment with respect to the wheel hub and gage line, while the wedging action of the rings locks it securely in place.

It will be appreciated that the renewal of this tire is a much shorter job than is the case with the ordinary shrunk-on type. Socket wrenches are the only tools

required, and the change can be made in the locomotive barn. With outside-frame locomotives it is only necessary to drop the axles, and with inside-frame machines the change can be made without taking the axle out of the frame.

The advantages of these demountable tires will be appreciated by anyone who has had to replace a shrunk-on tire. The complete replacement of the new tire can be effected by two men in about 15 min. for each wheel.

With the co-operation of W. A. Chandler, electrical engineer of the H. C. Frick Coke Co., a 6-ton gathering locomotive with an experimental braking equipment of the type here described was placed in service at the above-named company's coal mines near Uniontown, Pa. This has been in successful operation for the past two years, during which time the necessary refinements were worked out under actual service conditions.

A 20-ton main-haulage locomotive with similar braking control has been handling loaded trains on a 4,000-ft. line with 4 to 5 per cent grades for about one year. It is therefore evident that the principles embodied in the new gathering locomotive have fully demonstrated their value in actual service. The locomotive here described was designed by engineers of the General Electric Co.

Meeting Difficulties of Centrifugal Pumping By Suitable Construction

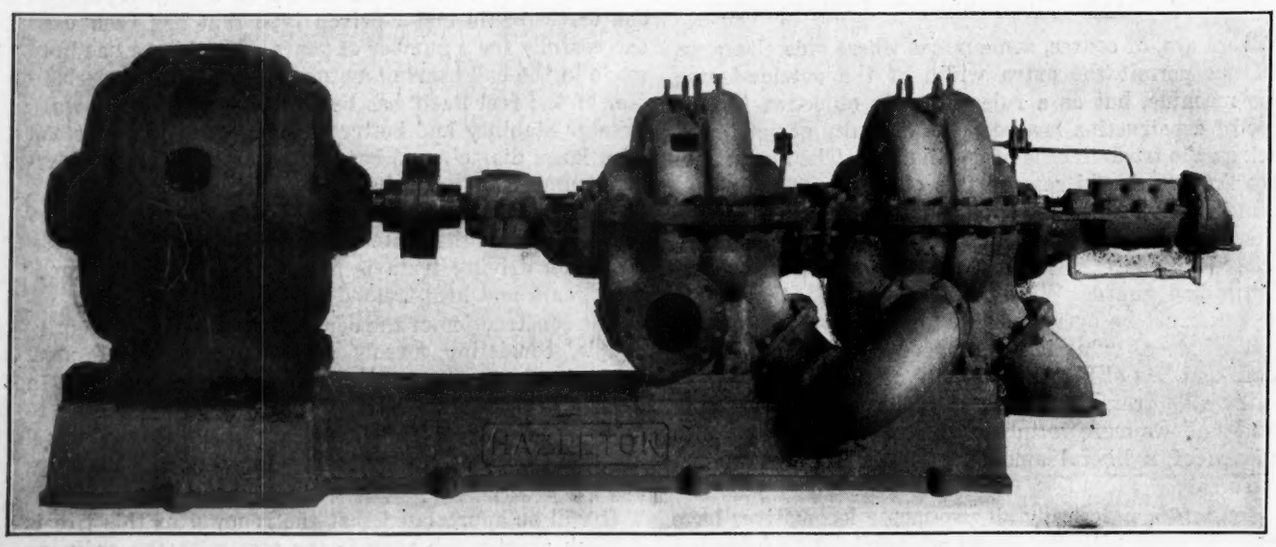
End Thrust is Met by Hydraulic Balancing—Diffusion Rings Are Omitted—Wearing Rings Reduced from Four to Two—Internal Parts Made Readily Accessible—Centrifugal Pumps Have Large Capacity

MANY mining engineers hesitate to install centrifugal pumps for handling mine water for two reasons—the high upkeep cost and the tendency of the machine to break down when most needed. Pumps designed for handling fresh water give poor service in mine drainage, even if made entirely of bronze. Quite satisfactory results can be obtained, however, with pumps especially built for the mines. Wear on the rotating parts in contact with the water cannot be avoided. A mine pump should, therefore, have few wearing parts in order to minimize the upkeep expense. Furthermore, the pump should be hydraulically balanced, since most shutdowns arise from end thrust.

Single-suction multi-stage pumps are particularly inclined to "shove." Wnat causes the end thrust is sometimes hard to determine, especially when the impellers are surrounded by diffusion rings, that hamper inspection. It may be caused by blocked impellers or excessive wear of the impellor seal rings. Again the impellers may not be in line with the diffusion rings, or other slight imperfections or maladjustments may exist.

As is well known, single-stage, double-suction, volute pumps give excellent service in the mines because they have few parts and are hydraulically balanced. They are absolutely reliable if equipped with a bearing that will take care of end thrust. (Fig. 1) The Hazleton two-stage volute pumps are built along the same lines as the double-suction volute machines. The water enters the impellers from both sides (Fig. 2), but there are two volutes combined into one casting, the discharge from the first passing under the second volute and up into the eye of the second impeller, so that the volutes work in series and produce twice the head obtained in a single-stage pump. This arrangement obviates the necessity for diffusion rings, commonly used in two-stage pumps, and reduces the number of wearing rings from four to two. This not only means less upkeep cost but also less internal leakage and in consquence a much longer maintenance of the original efficiency than diffusion-ring pumps can show.

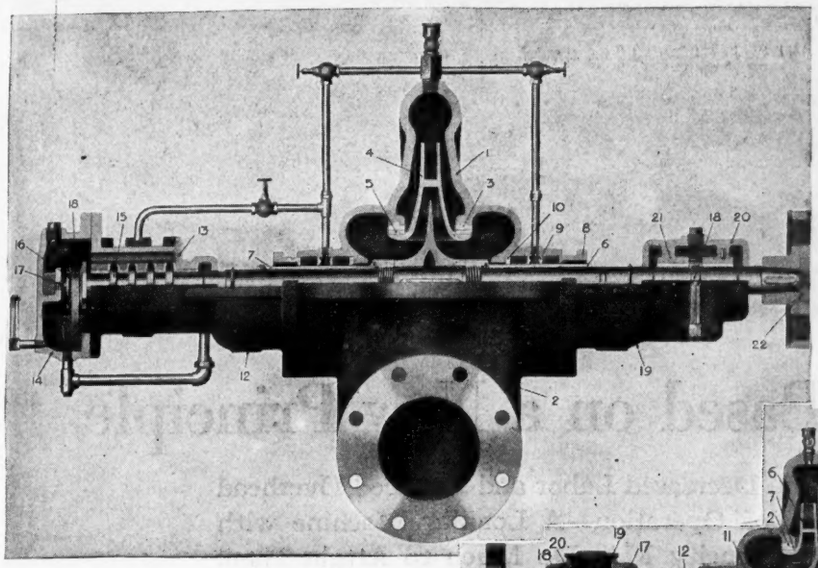
The absence of diffusion rings makes inspection easy, as all internal parts are readily accessible. The water is led from the first volute into the suction head of the



HYDRAULICALLY-BALANCED, ELECTRICALLY-DRIVTN PUMP
Discharge from one section of this unit is made to the suction of the other, thus compounding the effort.

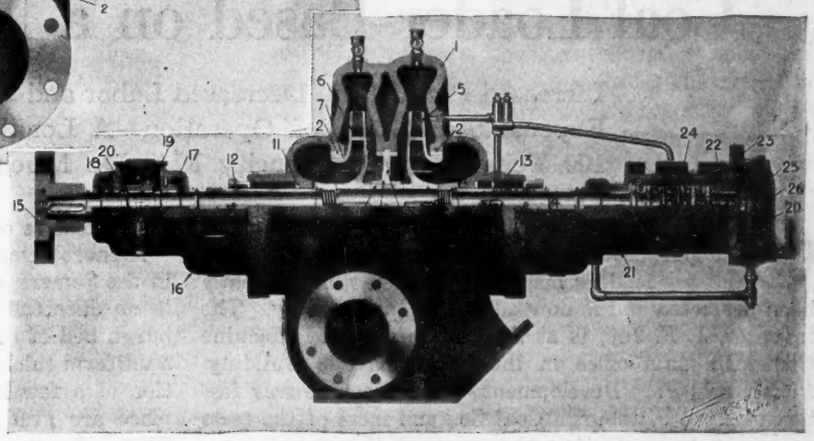
second through a carefully designed passage, so that good efficiency and a compact casing are obtained. This design is covered by patent. The pump is balanced like a double-suction machine. If two two-stage pumps are connected in series, a four-stage pump is obtained in which the impellors are mounted alternately opposed on the shaft, so that the first impeller balances the second and the third balances the fourth. Heavy end thrust is, therefore, not likely to develop, but should it do so the cause can easily be detected, as the casing "top halves" are comparatively light and can quickly be removed. The advantage of this construction is still more apparent in an eight-stage pump. Two men without the use of a hoist can easily lift off the top halves of a 500-gal.-per-minute machine of this type and four men the top halves of a 1,000-gal.-per-minute pump. A spare motor can be installed in a short time, and as the impellors have liberal clearance in the casings, fine lateral adjustments that have to be made in diffusion-ring pumps are not necessary. A four-stage pump has only four impellor sealing rings and the upkeep cost is low. The casing is fitted with removable casing rings. A rubber gasket is inserted outside of these rings, the rubber projecting slightly above the surface and preventing any leakage between casing and ring. The rings are so heavy that they will stand reboring, so that they will last twice as long as those commonly used.

Not only the internal, but also the external parts of the pump are specially designed for mine service. The thrust bearing is self-oiling and water-cooled. The cooling water is not under pressure and cannot leak into the bearing. The water jacket is open and can easily be cleaned, as water containing "yellow boy" soon clogs narrow passages. The cooling water valves and flanges are made of acid-resisting bronze, while the piping is of copper.



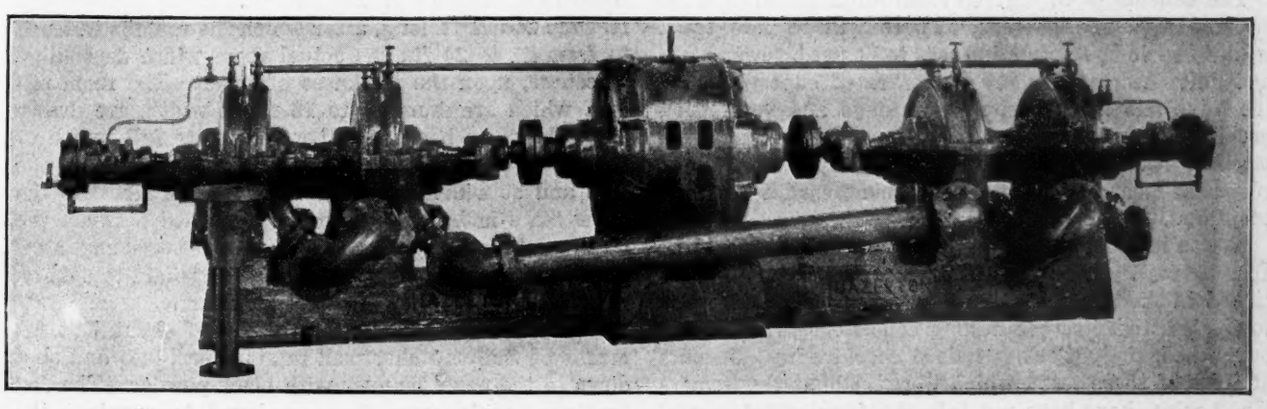
BELOW—HALF SECTION OF A DOUBLE UNIT

The direction of suction of the two impellers is here opposite, thus tending so secure balance.



ABOVE—HALF SECTION OF A SIMPLE UNIT

Suction is made from both sides of the impeller, thus securing balance.



ELECTRICALLY-DRIVEN FOUR-STAGE PUMP

The various elements or stages of this machine are compounded thus securing a high working pressure, while the arrangement is such as to secure hydraulic balance.

Coal Loader Based on a New Principle

Increased Production, Decreased Labor and Reduced Overhead Expense Are Goals of Operation—A Loading Machine with 100 Tons Per Day Capacity May Do Much to Attain Them

ONE of the devices developed during the war for the purpose of stimulating coal production was the Joy loading machine. This has only recently been perfected and is now offered to the industry. The inventor, J. F. Joy, is at the head of the Joy Machine Co., with main office in the Union Arcade Building, Pittsburgh, Pa. Development of the machine was fostered by the Pittsburgh Coal Co., and most of the tests necessary in perfecting the mechanical principles involved in the construction were made at the Somers No. 2 mine of this company. This operation, which is used principally as an experimental one, is located at Belle Vernon, about 42 miles south of Pittsburgh.

It is the dream of every operator to increase production, decrease labor and at the same time be able to reduce overhead expenses. Several factors of high economic importance may be effected by a loading machine. The most important of these is the fact that it would be possible to mine a given output from an area about ⅓ as great as where hand loading is employed.

The benefits to be derived from mining coal in a restricted area are obvious. There will be less track work to be done, fewer mine cars to be used, fewer haulage units necessary, more concentrated supervision of the mine and a more simple drainage and ventilation problem. In mines where a friable roof is encountered, machine loading permits of a more rapid advance of rooms and entries, with a consequent earlier drawing of pillars.

It was hoped that the new loading machine would be able to realize by practical results the theories mentioned in the above paragraph. From a series of tests conducted under severe mining conditions in the Pittsburgh bed, the outlook is indeed encouraging. Results of some of these tests, which were made at the Somers No. 2 mine, have been put into the form of tables and accompany this article. The data contained in them are indicative of the high efficiency of machine loading.

A short description of mining conditions encountered in the Somers No. 2 mine will show that this operation is no different from many others in which the Pittsburgh bed of coal is being developed. This bed carries a uniform thickness of 70 to 72 in., and with the exception of a few local swamps is practically level. At no place are grades encountered that exceed 7 per cent. The coal rests on a firm limestone floor but the roof is composed of draw slate which varies from a few inches to as much as 4 ft. in thickness. Considerable trouble is experienced with it as it usually falls as soon as the coal is shot down. In cases where this does not occur the roof is disturbed to such a degree as to make working extremely dangerous. Above the draw slate the roof is fairly strong and permits posting to be kept from 10 to 15 ft. in rear of the face.

The room-and-pillar method of developing the coal is employed. Entries 9 ft. wide are driven in pairs on 50-ft. centers. Rooms on 39-ft. centers are driven off these to a distance of 250 ft. The room necks are 9 ft. wide and 21 ft. long, after which the room is widened to from 21 to 24 ft., the actual room width depending, of course, upon the thickness of cover. The room pillars, which are from 15 to 16 ft. in width, are drawn after the room has been advanced to its full length of 250 ft. The track in each room is carried along one side and at a distance of 6 ft. from the rib. As the draw state is brought down it is gobbed between the track and the opposite rib. Twenty-five-pound steel rails are used in the room track, which is laid to a 42-in. gage on wooden ties, spaced 2 ft. apart.

The coal was undercut to a depth of about 7 ft. by means of Sullivan shortwall mining machines and shot down in the usual manner with black powder. The Joy loading machine was then employed to supplant the common method of hand loading.

A brief sketch of the machine was published in the Nov. 27 and Dec. 4 issue of *Coal Age*, covering one of the machines in operation on the surface. Coal was reloaded from a stock pile at the Montour No. 10 Mine of the Pittsburgh Coal Co. The details of operation at that mine will again be touched on and when perused in connection with the accompanying illustrations will show some of the mechanical innovations embodied in the machine's construction.

TABLE I. SHOWING RESULTS OF OPERATION DURING DECEMBER, 1917

Date	Hours Worked	Cars Loaded	Tons	Hours Delayed	Causes of Delays and Remarks
1	8	37	74	0	Machine operated in room necks.
3	8	57	114	0	
4	1	3	6	7	Broke swing shaft.
5	8	85	170	0	
6	6	49	98	2	Broke gathering arm.
7	4	28	56	4	Broke gathering arm.
8	8	61	121	0	
10	8	47	94	0	Short crew.
11	8	63	126	0	
12	8	60	120	0	
13	8	56	112	0	
14	8	53	106	0	
15	8	57	114	0	
17	8	53	106	0	
18	5	33	66	3	All mine cars filled.
19	6.5	58	116	1.5	Waiting for mine cars.
20	6	54	108	2	Repairing storage hopper.
21	8	70	140	0	
22	7	50	100	1	Waiting for mine cars.
24	7	50	100	1	Waiting for mine cars.
26	3	23	46	5	Haulage locomotive broke down.
27	6	41	82	2	Waiting for mine cars.
28	6.5	58	116	1.5	Waiting for mine cars.
29	8	53	106	0	
31	6.5	52	104	1.5	Repairing storage hopper.
	168.5	1,251	2,501	31.5	

SUMMARY

Working days	25.0
Hours machine operated	168.5
Cars loaded	1,251.0
Tons	2,501.0
Hours delayed	31.5
Hours delayed due to machine failure	16.5
Working hours in month	200.0
Time lost due to causes other than machine failure	15.0

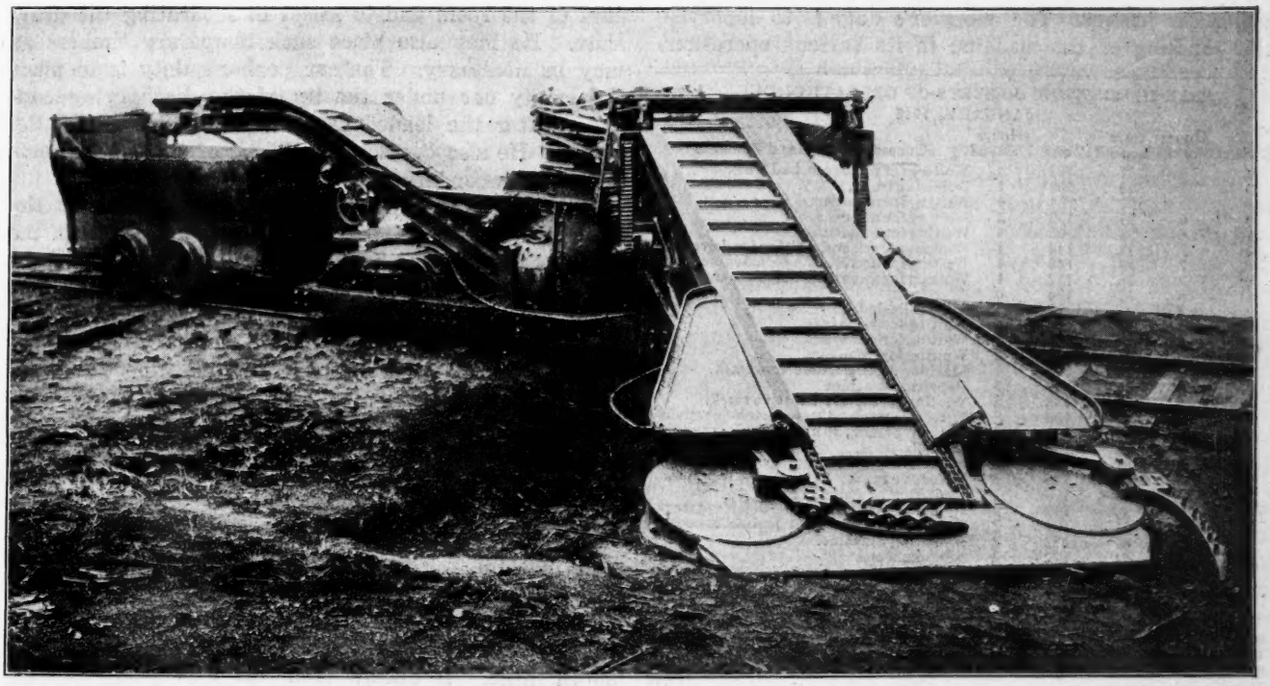
The machine, which weighs about nine tons, is electrically driven and is 29½ ft. long, 5 ft. wide and 5 ft. high. It is moved under its own power at a maximum speed of eight miles per hour, the speed of travel being at all times under the control of the operator.

As shown in the accompanying illustrations, two conveyors are embraced in the construction. One of these reaches from the gathering mechanism to a storage hopper that constitutes the body of the machine. A second conveyor is utilized to discharge the coal from the hopper into the mine car, which is located to the rear of the machine. Both conveyors are flexibly mounted on the supporting truck and may be swung to nearly any angle. This feature of construction permits the machine to traverse short-radius curves such as those at room entrances.

The gathering mechanism is placed at the forward end of the loading conveyor. Briefly, it consists of a pair of geared fingers that are arranged so as to be positively driven in a fixed orbital path. The initial movement of the fingers is forward into the coal, after which there is a raking motion across the coal face and then a rearward movement toward the loading conveyor. From this point the movement is a return to the starting position. The path of the finger tips is shown in Fig. 3.

After the machine has been brought into the room where it is desired to load the coal, the loading conveyor is lowered so as to bring the gathering mechanism at the front end into contact with the floor. The machine is then propelled forward until the gathering mechanism is in close proximity to the loosened coal, after which it is set in motion and the machine bodily moved forward on the track until the fingers in their orbital movement engage the coal and gather it onto the loading conveyor.

The gathering mechanism is of simple but rugged construction and with its undermining action is capable of loosening the coal from a semi-undisturbed state. Safety measures in the form of friction clutches are provided so as to prevent destruction of the gathering mechanism when the fingers encounter relatively immovable lumps of coal.



JOY LOADING MACHINE IN OPERATING POSITION

The forward conveyor is swung to one side and the gathering head lowered. The fingers working alternately from either side gather the coal to this conveyor. This discharges to a hopper feeding the second or rear conveyor, which loads the cars.

The principles involved in the construction of the machine are departures from any other attempts that have been made along this line. In the first place the gathering mechanism with its horizontal, penetrating, undermining action is effectual in winning coal from a semi-undisturbed state. This allows for a fairly conservative use of explosives. The storage hopper goes a long way in solving the transportation problem since it makes possible the changing of cars without interrupting the operation of gathering the coal from the floor.

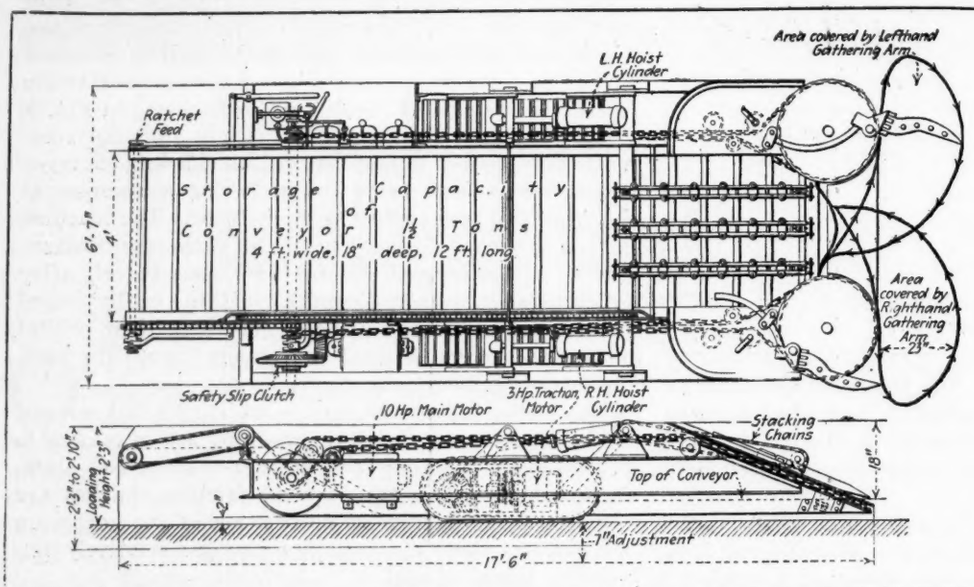
The new loading machine was first placed in service on Dec. 1, 1917, and has been operated continuously ever since. Several of the machines are now in operation, each of which is capable of maintaining an average daily production of 100 tons. This is really a highly conservative figure for an eight-hour day.

The machine crew consists of an operator, a helper and a car pusher. The operator's duty is to supervise the handling of the machine in its various operations and to oversee and assist with the cleaning of the coal as it passes up the loading conveyor and into the storage hopper. In this respect the loading conveyor is not unlike a small picking table, and with ordinary care exercised in the cleaning there should not be any further need for picking on the surface.

The duties of the helper are to clean up the coal fragments that may be left by the machine in the corners of the room and to assist in separating the draw slate. He may also place such temporary timbers as may be necessary. The car pusher's duty is to place the empty car under the lip of the discharging conveyor after the loaded car has been removed by the driver. He also oversees the filling of the car by operating the secondary or discharging conveyor.

TABLE III. RECAPITULATION DECEMBER, 1917, AND JANUARY, 1918

Working days	51.0
Hours machine operated	314.5
Cars loaded	3,845.0
Tons loaded	5,689.0
Hours delayed	93.5
Hours delayed due to machine failure	27.0
Possible working hours	408.0
Average tons per working day	111.0
Percentage of time lost due to machine failure	6.6
Average tons per hour machine operated	18.0



Plan of the Low Model Machine

The paths of the fingers are here plainly shown. In this low model the second conveyor serves for a temporary storage in place of the hopper used on the higher machine. This will carry when full a sufficient amount of coal to appreciably shorten the time necessary to fill a car upon the track behind the machine.

TABLE II. SHOWING RESULTS OF OPERATION DURING JANUARY, 1918

Date	Hours Worked	Cars Loaded	Tons	Hours Delayed	Cuases of Delays and Remarks
2	4	51	102	4	Waiting for mine cars, bad track.
3	7	90	180	1	Defective track.
4	4	52	104	4	Waiting for mine cars.
5	6	75	150	2	Waiting for mine cars.
7	4	34	68	4	Waiting for mine cars.
8	7	72	144	1	Defective track and waiting for driver.
	7	74	148	1	Waiting for driver, 30 min. machine repr.
10	7	76	152	1	Waiting for mine cars, defective track.
11	8	87	174	0	
12	3	45	90	5	All cars loaded.
14	3	29	58	5	Waiting for mine cars.
15	4	62	124	4	Waiting for mine cars.
16	6	61	122	2	Waiting for mine cars.
17	7	71	142	1	Machine off track, defective track.
18	5	41	82	3	Repairing machine.
19	6	74	148	2	Waiting for driver, defective track.
21	5	69	138	3	Defective track, 30 min. machine repairs.
22	6	64	128	2	Defective track, 30 min. machine repairs.
23	6	69	138	2	Miscellaneous.
24	5	61	122	3	Miscellaneous.
25	6	63	126	2	Defective track.
26	6	55	110	2	Repairing machine.
28	6	56	112	2	Repairing machine, 1 hr.; defective track.
29	6	51	102	2	Repairing machine, 1 hr.; miscellaneous.
30	6	61	122	2	Repairing machine.
31	6	51	102	2	Miscellaneous.
	146	1,594	3,188	62	

SUMMARY

Working days	26
Working hours	208
Hours machine operated	146
Cars loaded	1,594
Tons	3,188
Hours delayed	62
Hours delayed due to machine failure	10.5

In considering the production figures shown in the accompanying tables it must be remembered that the machine crew had to handle from 40 to 60 tons of draw slate in loading 100 tons of coal. In this respect the draw slate was a serious handicap in establishing any kind of a record. However, the tables are really of more practical value than if the machine had been allowed to work under ideal conditions and records made that would not convey any idea of operation under actual mining conditions. It is quite probable that if the machine had been operating in a bed free from troublesome draw slate the production would have been nearly if not quite doubled.

A machine for use in thin beds is being manufactured although at present there are none of this type in operation. The mechanical principles of construction, however, are the same. This machine will be but 30 in. high. It differs from the type that has been described in that it is provided with a caterpillar tread. Construction details of this type are shown.

Avoidance of Clinker When Burning Coal With Low-Fusing Ash

Under Ordinary Conditions Coal with a High-Fusing Ash Has a Marked Advantage Over a Fuel with a Low-Fusing Ash—This Superiority Disappears with Suitable Stoking

By T. A. Marsh
East Chicago, Ind.

MUCH interest has been evinced by the entire coal-producing and coal-consuming public in the data by Mr. Selvig of the Bureau of Mines covering the fusibility of coal ash from all districts of the United States, recently published in *Coal Age*. These findings will stand as the authority on this subject for many years to come.

Some of the earliest work along these lines was carried on by the late J. W. Sparrow, chief engineer of the New York Edison Co. Mr. Sparrow observed in his boiler room operation that frequently massive clinker formations would put boilers practically out of service. He therefore began investigating analyses of the coals which caused the trouble. Finding nothing in the proximate or even in the ultimate analysis that would unerringly indicate clinkering proclivities, he began working directly with the fusion point of the ash of each of the coals employed.

This investigation of the fusion point of ash opened up a wide field of inquiry, and the result of Mr. Sparrow's investigations was that out of about twenty possible fuels, a group of only five or six was found suitable as being free from clinkering, as indicated by the high fusion temperature of the ash.

Clinker Is Nothing But Fused Ash

To consider the practical application of Mr. Selvig's data and the correlation of laboratory with boiler room results we must consider exactly what clinker is. Clinker is nothing more nor less than fused ash. Ash fuses when it is brought to a temperature above its melting point. With some coals the melting, or fusion, point of the ash is as low as 1,800 deg. F., while the ash from others will not fuse until it has reached a temperature of 2,200 deg. The refuse from still other coals requires as much as 2,400 deg. and among the least fusible are those that require a temperature of 2,800 deg. F. before melting occurs.

Furnace temperatures as high as 2,200 to 2,400 deg. are frequently obtained. Temperatures beyond this point are seldom reached in practice, and consequently if coal whose ash fuses at a temperature below 2,400 deg. is used in a furnace which operates at a temperature in excess of 2,400 deg. the ash will melt if brought into that part of the furnace where the high temperature occurs. If the ash requires 2,600 or 2,800 deg. F. in order to melt, bringing it into a furnace temperature of 2,100 deg. causes no clinkering.

There are therefore two possible methods of avoiding clinker in furnaces operating at high temperatures: Either keep the ash cut out of the part of the furnace where the high temperature exists, or use only coal which has an ash fusing at a higher temperature than 2,400 deg. F. If all of the available fuels are low-fusible-ash coals, it becomes necessary to select such stoking equipment as will not bring the ash into the zone of high temperature in the furnace. If, on the other hand, a variety of high- and low-fusible-ash coals are available, it is possible to select only those which have high ash-fusion temperatures. This selection is actually being made throughout certain districts of the country, particularly in the East, where coals with high- and low-fusible ash are available in many markets. It inflicts serious handicap on the producers of coals with a low fusible ash, and is a condition which ultimately will be corrected as we learn to burn all of our fuels regardless of such characteristics as tendency to form clinker.

High Temperatures Are Desirable

In those markets where high-fusible-ash coals are not available, such as in the Middle West and West, coal consumers have learned to handle the low-fusible-ash, or clinkering, coals in a way to avoid all clinker trouble. The method of doing this is not to reduce the furnace temperature, as high furnace temperatures are desirable and necessary in order to secure high efficiency. It is not to change the coal and select only those fuels whose ash will not melt in the furnace, for such coals are not available; but the method employed is to keep the ash out of the zone of high temperature in the furnace. This is not as difficult to accomplish as might be supposed. It simply involves not stirring the coal or turning it over after it is once ignited.

Comparatively few coals west of Pittsburgh have ash with a high fusion point. Moreover, the quantity of ash in such coals is high. Therefore, where Mr. Selvig's paper indicates a high percentage of ash and a low fusion point, the common expression in describing such a coal would be that it "makes clinker and lots of it." This is the general characteristic of coals of the Middle West and the West. Some are a little better than the average, many are worse.

Fuel Agitation Must Be Avoided

To put these coals on stokers that agitate the fuel bed and which bring the ash up into the zone of high temperature is disastrous to economy, capacity and even to the continuous operation of the stoker and boiler. Practically all Western plants therefore must use stoker types which do not agitate the fire bed and which carry the fuel entirely through the furnace and continuously discharge the ash. The chain grate is an adaptable stoker in this field, and because of the charac-

teristics of the coals here produced this type is largely used. In plants equipped with chain-grate stokers the question of fusibility of ash never arises, as the ash is always on the lower side of the fuel bed and is not disturbed or thrust up into the zone of high temperature. Consequently clinkering does not occur.

The selection of the right type of stoking equipment for the fuels tributary to the plant is highly important. If the entire fuel market is available, regardless of the fusibility of the ash, certainly the purchaser is in a position to obtain his fuel to better advantage than if he is limited to certain high-class coals. Furthermore, the producer is in a better position to offer a continuous supply and a more attractive proposition if all of his coals are desirable fuels for the plant in question.

One of the worst combustion-engineering errors possible is the selection of the wrong stoker for the fuel available. For instance, when a stoker which agitates the fuel bed is selected for a low-fusible-ash coal, it is only a question of time until live steam jets will be installed along the walls of the furnace to soften and disintegrate clinker. It is possible to accomplish this result to a marked degree, but the steam consumption is so great that it is now well known that the installation of such steam jets is a frank admission that the wrong stoker has been selected.

Coal consumers are interested in this problem as it is their business to select stoker types suitable for the fuels available. Coal producers are forced to be interested in the problem as many of them will, if they have not already done so, find their coals discriminated against because of clinkering characteristics as determined in practice and as indicated by the fusibility of the ash. From the standpoint of national economy we must certainly all work to the utilization of all of our resources in the most efficient manner possible, and the more thoroughly we understand the problem in connection with our coal characteristics, the fewer will be our mistakes.

Machine That Cuts Coal Without Alighting From Its Carriage

Turntable Type of Machine Cuts at Almost Any Level, Removing the Impurities Where Desired or Cutting the Coal so That a Safe and Even Roof Is Secured

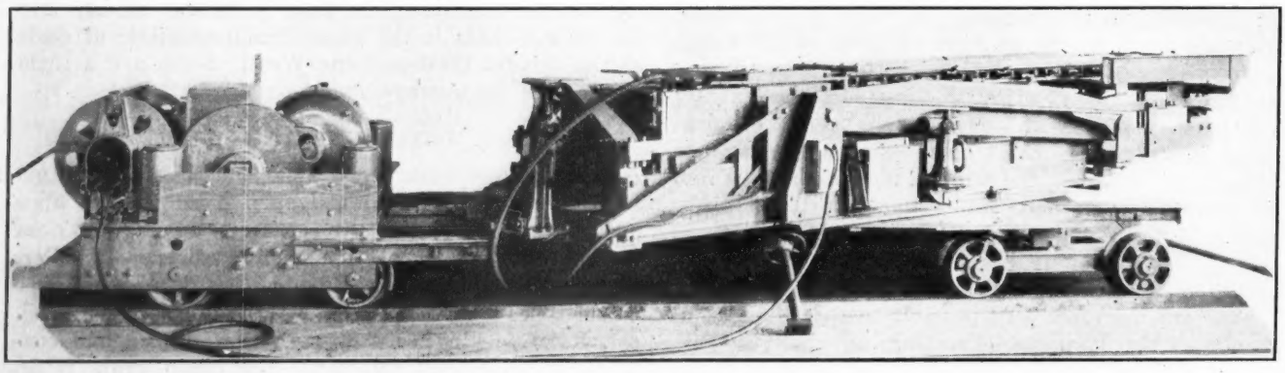
IN the evolution of coal cutters every one of the practical machines has attained its present status not by wholly eliminating its predecessor but by meeting mining conditions for which other types were not entirely adequate.

In manipulating the pick machine, which was the first practical coal cutter, the operator had to direct every blow and his helper was required to shovel back the cuttings as fast as they were made. When the breast machine was perfected much of this labor was saved and more coal was cut yet with less effort, but the breast machine never entirely supplanted the pick machine because it was not adaptable to all mine conditions. To load and unload the breast machine from its truck, to bar it across the face, to set the jacks and to shovel the cuttings, all took labor.

This machine was followed by the continuous coal cutter or shortwall machine. The latter accomplished more cutting with less labor, as this machine was loaded, unloaded and moved across the face under its own power, but it likewise never completely supplanted its predecessor because conditions were encountered to which the breast machine was better suited than the shortwall type.

A number of experimental machines followed, but as they never reached commercial favor they cannot be considered as actual progressive steps in the development of coal-cutting equipment.

The turntable type of cutter of the Morgan-Gardner Electric Co. is the latest development. Here the labor of operating is further reduced, as there is neither loading nor unloading, nor yet shoveling of cuttings. Notwithstanding the fact that the field of usefulness of this machine is probably wider than that of any other type, it is likely that it will not entirely displace the shortwall machine.



TURNTABLE CUTTER AND ITS TRAILER

Really the propelling element, the trailer pulls or pushes the cutting machine from place to place.

The turntable machine is particularly suitable for such work as cutting out dirt bands, cutting in the center of thick beds or near the top, leaving coal to protect the roof from weathering or to furnish strength and also safety under what would otherwise be a bad and dangerous roof, thereby saving timbering, the handling of fallen rock and other expensive dead work.

In one field where there is a 3 ft. bed of good coking coal overlaid with a soft brash coal from 18 in. to 2 ft. thick the brash cannot be allowed to mix with the coking coal because it practically ruins the coke. The machine, cutting just above the coking coal, brings out in making the cut virtually all the stratum of brash, leaving the lower bench separate and clean, so that it can be loaded without danger of contamination.

In another field the machine has pronounced usefulness beyond making the cut. Here a 5-ft. bed is overlaid by 2 in. of "cube bone coal," which makes a bad separation from the good coal when shot with it. Accordingly the cut is made in the bone coal and overlying slate, leaving the entire bed to be shot and loaded out. The quality of the coal thus is made better both by eliminating the bone and by producing a larger percentage of lump.

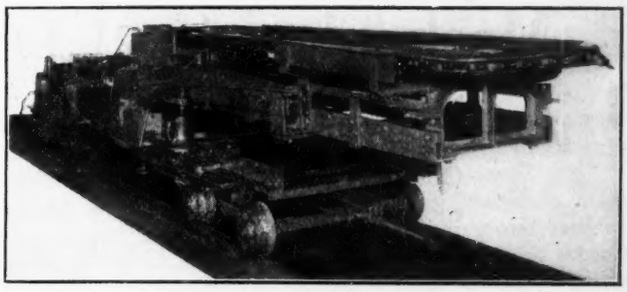
In a number of mines where the roof was so bad that it was almost impractical to mine at all, this machine came to the rescue by cutting in the coal a short distance below the top, making a good, smooth coal roof. Another machine has been built and with it an attempt is about to be made in a 9-ft. bed to make a cut 92 in. above the track, leaving enough coal to form a good roof.

There is a possibility that the new turntable type of machine will prove to be highly useful in thin beds where it is necessary to take up bottom to make height. In such work the truck and propelling motor equipment remain on the track in the space excavated, while the cutting element swings over the bottom in the space left by the removal of the coal. Within certain limits the cut can be placed at the top or bottom of such a bed, as may be desired.

This machine is composed of three principal elements —the propelling device, the turntable truck and the cutting machine proper. The propelling portion, which is really a small locomotive, carries part of the weight of the turntable truck and cutting machine, while the remainder of the weight is carried on a bogy truck under the turntable. This arrangement distributes the weight on eight wheels, so that the machine can travel safely on light rails. The propelling element is equipped with a motor, trolley pole, automatic cable reel, sand boxes, seat for the operator, tool box and supports for carrying the jacks.

The turntable element is flexibly mounted on the forward truck. It is composed of two plates pivoted together, the upper plate being free to rotate on antifriction rollers held in the lower plate. Provision is made for locking the plates together for each cutting position. To the upper plate are attached the adjustable supports for the cutting element. As this element is adjustably mounted at three points only, in can be raised and lowered to cut at various heights horizontally or to cut upward or downward through a wide angle. It can also be tilted laterally a short distance.

The machine proper is of the breast type but is designed and built for turntable requirements. This type lends itself well to the conditions encountered, as it feeds out and reaches a great distance from the



FRONT VIEW OF THE TURNTABLE MACHINE

The cutting element strongly resembles that of a breast machine. It may be raised, lowered or swung from side to side.

track, yet its frame holds it rigid when the cut is being made. The whole machine is necessarily long, and it might well be expected that difficulty would be encountered in traversing short curves and in entering narrow places, but this is entirely overcome by automatically turning the cutting machine on its turntable whenever it travels around such turns. It actually overhangs the track less than does the ordinary breast or shortwall machine designed to cut an equal depth.

As this machine is a recent production, in its construction such effective modern devices as enclosed gears and motors, ball bearings, special alloy steels and heat-treated parts are utilized. The turntable machine is the product of nearly thirty years of experience in the design and construction of successful coal cutters. It therefore will be likely to hold a high place as a coal producer until the combined cutting and loading machine reaches its final perfection.

Violation of Statutory Safety Regulation.—A rule embodied in the Pennsylvania Anthracite Mining Act reads: "No person shall ride upon or against any loaded car, cage or gunboat in any shaft, slope or plane in or about a mine or colliery." In the case of *Petrowsky vs. Delaware, Lackawanna & Western Railroad Co., 250 Federal Reporter, 554*, the defendant unsuccessfully sought to defeat liability for injury to a boy 17 years old, sustained while riding on a loaded car in violation of this rule.

The United States Circuit Court of Appeals, Second Circuit, holds that if, as testified by plaintiff, he was riding on the car in obedience to instructions given by the driver boss of the mine, the slope runner, and the engineer in charge of the cable handling the cars, and if he had frequently ridden on the cars daily, the defendant mining company may be deemed to have been guilty of actionable negligence in exposing the plaintiff to the peril resulting in his injury. On the question of contributory negligence the court says:

"The fact that a boy of 17 by obeying an order given to him by one in authority over him violates a provision of this kind in the statute which he is not shown to have known cannot be an excuse as between him and the master, and especially is this true where the master, as in this case, did not post the rules as the act required."

Defendant also asserted that it should not be held liable in this case because the accident was shown to have resulted from a defective condition in the track, for which the mine foreman and not the company was responsible, but the court decided that the wrong in directing or permitting plaintiff to ride on the car was closely enough related to the injury suffered by him to sustain recovery of damages.

Mechanical Coal Loading as Adapted to Room-and-Pillar Work

Cost Data with Rooms 26 Ft. Wide—Loading Cost Is Halved—Investment in Loading Machinery More Than Counterbalanced by Saving in Other Directions Such as House Construction and Mine Development

BY WILLIAM WHALEY
Knoxville, Tenn.

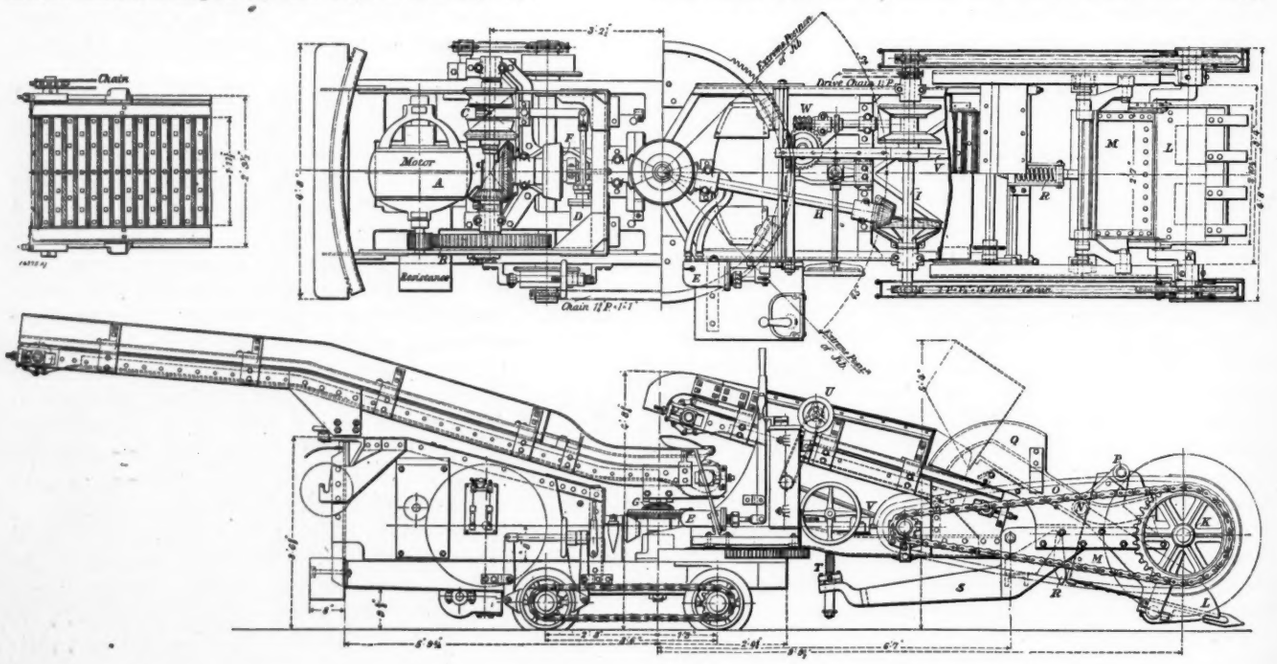
FOR a number of years leading coal operators have been more or less interested in the possibility of loading coal underground mechanically. At present interest in this subject is keen, as mechanical loading appears to be the missing link in the complete mechanical equipment of modern coal mines. As Van H. Manning, director of the Bureau of Mines, pointed out in a paper before the American Institute of Mining Engineers: "The drilling and loading of coal should, as rapidly as mechanical facilities are perfected, be done by power-driven machinery, thereby reducing the number of operatives required. The ideal mine installation of the future will be one mechanically equipped throughout and the mine force should gradually evolve into one required primarily for operating and maintaining the machinery employed."

A number of manufacturers are prepared to furnish machinery for loading coal underground. Some have machines to offer for cutting, breaking down and loading all in one unit; others have scraper outfits for low-bed work; others, again, have portable conveyors, upon which the coal is placed by hand, while others offer shoveling machines which employ an automatic shovel and load the loose coal from the floor into the mine car. Each type of equipment has its well-defined limitations. This paper deals with the shoveling machine as originated and developed by the Myers-Whaley Co.

The "Myers-Whaley" is the outcome of many years of development. The initial device was built twelve years ago and the development has progressed steadily until now these machines are in use for loading almost all conceivable materials in underground mining. An example of the use of this machine is contained in the following extract from a letter written by a coal mine manager in Utah:

"We have had this machine in operation since last January with satisfactory results. Our coal varies in height from 16 to 23 ft. Rooms are driven up about 12 ft. high, the balance of the coal, until pillar extraction begins, being left to support the roof. At the present writing we are using the machine in entries, as we have had some difficulty in getting men to drive our narrow work, and while we do not get the tonnage from the machine which we secured when working in rooms, we do get the development, which at present in our case is of more importance. It is handling four to five faces, the extreme distance traveled being about 1,200 ft. When working in rooms we use this machine in a panel where we have a number of places the length of which would average 300 to 350 ft. The machine cleaned up approximately 140 to 150 tons per shift of eight hours."

An example of the use of the machine in other materials than coal is found in the shale mine of a large



PLAN AND ELEVATION OF A MYERS-WHALEY LOADER
This consists of a shoveling and a loading element. In this instance the loading conveyor serves as a temporary storage to facilitate changing cars.

manufacturer of portland cement. This mine is laid out on the room-and-pillar system. The rooms are driven on 49 ft. centers, 26 ft. wide and about 200 ft. long. The cars hold two tons. The track gage is 30 in., and power is supplied at 500 volts direct current. The first machine was installed in February, 1916. It loaded over two hundred tons of material per 8-hour shift as an average, with a big reduction in cost. The entire crew of the machine consisted of one operator, one helper and one car coupler.

The company that bought this machine has the reputation of being highly conservative in purchasing equipment, and absolute proof of the economy, reliability and desirability of the device is shown by its putting in a second machine in March, 1916, a third in the summer of 1917 and a fourth in the summer of 1919—all in the same mine. Similar satisfactory installations have been made in many other operations.

An analysis of existing conditions and results to be accomplished with these machines in coal mining is given below. This is taken from data concerning a new coal mine which is now preparing to begin operation and install shovels as initial equipment:

BED—6 ft. thick, clean coal, shoots well.
POWER—230 volts, direct current.
ROOMS—30 ft. wide, two tracks, 44-in. gage.
CARS—4-ton capacity, 35 in. high from rail.
RAIL—40-lb. on entries, 30-lb. in rooms.
MACHINES—No. 3 size Myers-Whaley shovels.
OUTPUT—1,000 tons per day.

Analysis of loading cost per day is as follows:

LABOR:		
One machine operator	$5.75	
One helper	5.25	
Two car men at $5	10.00	
		$21.00
OTHER EXPENSE:		
Power	$2.00	
Oil and supplies	.50	
Upkeep, 1½c. per ton, 210 tons	3.15	
Interest, $9,000 at 6 per cent, 250 days	2.16	
Charge off investment, 20 per cent per annum.	7.20	
		$15.01
Shoveling costs		$36.01
SHOOTING COAL:		
Two men at $5	$10.00	
Powder	4.00	
		$14.00
Total cost shooting and loading		$50.01

Each room makes 60 tons of coal and with liberal allowance for operative delays 3½ rooms will be loaded per shift, or 210 tons, at a cost of 23.6c. per ton. The hand loading scale in this district is 55c. per ton and it would take about 20 men to load 210 tons of output.

In considering a new mine, however, the following "incidental" advantages of machine loading can be fully realized: For each machine installed the service of 14 men can be saved and a better class of men usually will be secured. Each machine will save the building of about five dwellings that would be required if hand labor were employed exclusively for the loading of coal. Thus the saving in houses will pay for the investment in machines.

With machines also the required tonnage can be reached with a much smaller development. This means that the operator will get his desired production at a much earier date than with hand loading. Entries for development can be driven three times as fast at one-third the cost. The latter two items reduce trackage and incidental expenses. A smaller operating territory is required for a given tonnage, and mine bossés can keep closer to their work.

For the benefit of those who are not familiar with the Myers-Whaley shovel an outline drawing in plan and elevation is presented herewith. The machine is equipped with an automatic shovel supported and driven by a crank. The shovel discharges onto the forward conveyor, which in turn delivers its load to the rear conveyor, which in turn discharges into the mine car. The shovel and front conveyor are mounted on a swinging jib, enabling the machine to shovel at a distance of 8 to 10 ft. to each side of the track center. The rear conveyor also swings laterally so that it can load cars on curves or upon a parallel track.

The jib and rear conveyor are pivoted upon a main frame carrying the motor and propelling mechanism. This main frame is supported by four track wheels solid on their axles and mounted in adjusting pedestal boxes to allow for any inequalities of the track. The machine is moved forward and backward under its own power and uses no jacks or clamps. It is as portable as a mine locomotive and travels readily from room to room. The operator is provided with a seat on the jib where he can see and direct the shovel to its work. These machines are standardized and the component parts are interchangeable.

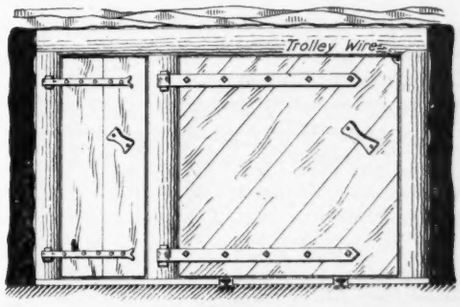
Separate Trapdoors for Men and "Motors" Obviate Accidents

BY G. E. DAUGHERTY
Pikeville, Ky.

TRAPDOORS are not the best means of distributing the ventilating current; but we find conditions where they are satisfactory and others where they cannot be avoided. An old saying that is particularly applicable to the hanging of doors and brattice cloth in mines is "Anything that is worth doing at all is worth doing well".

This point has not been lost sight of by the Northeast Coal Co., which operates a mine at Auxier, Ky., and which provides a small man-door in the same frame as the haulage door, but on the opposite side from the trolley wire. Ample clearance is left for a path along the roadway, which is kept clean, so as to make it more convenient for workmen to pass through the small door.

In this manner the company hopes to avoid, to a great extent, the possibility of accidents occurring, through men letting the main door stand open, or coming in contact with the trolley wire when passing through the door. The small door is pulled shut by a spring.



TRAP- AND MAN-DOOR IN ONE FRAME
Door for passage of men is placed at one side of the main door and is closed with a spring. A good walkway leads through this door.

Designing and Building Track to Avoid Trouble and Increase Capacity

Of the Great Multiplicity of Rail Sections, Fishing, etc., Only a Few Are in General Mine Use—Properly Designed and Fabricated Special Trackage in Many Instances Does Much to Aid Efficient Transportation

By Ira Dye
Hamilton, Ohio

THROUGHOUT their entire contact with modern civilization, coal and transportation are inseparably linked. So self-evident a fact would seem to require no elaboration, but the experiences of the past two years, both with coal and indeed with the problem of transportation in general, seem to indicate that the correlation is imperfectly understood.

The fuel producer depends on rail transportation for his supply of machinery, materials, tools and men required to operate his mine. Locally, in and about the works, he relies on rail transportation to move supplies, tools, men, coal and the waste material. Rail transportation carries the mine product to the consumer.

A chance is thus presented to make a careful study of conditions and so to perfect transportation at the mine itself, at least, that maximum production and minimum labor may go hand in hand. The whole history of American industry proves that it pays to provide equipment when such equipment will save labor. To remove drudgery from work and reduce the percentage which human muscular energy bears to the total energy expended has always meant progress, production and profit.

This article is concerned with the track structure upon which the car wheels roll, especially those parts controlling movements from one track to others. Practically all track plans are combinations of switches, switch stands, frogs, guard rails, crossings and curved and straight rails.

Various designs and types of these track specialties have been worked out to meet the conditions encountered in coal mining. Room turnouts, branches, sidings, main-line cross-overs, automatic switches, yard layouts, repair tracks, tipple and loader tracks, gravity switching layouts—each offers its peculiar problem, different, and yet similar, in each mine. Frequently the manufacturers of special track work, by reason of familiarity with the possible designs and with manufacturing problems, can save delay, expense and operating trouble if given a free hand in meeting a specific mine-trackage problem.

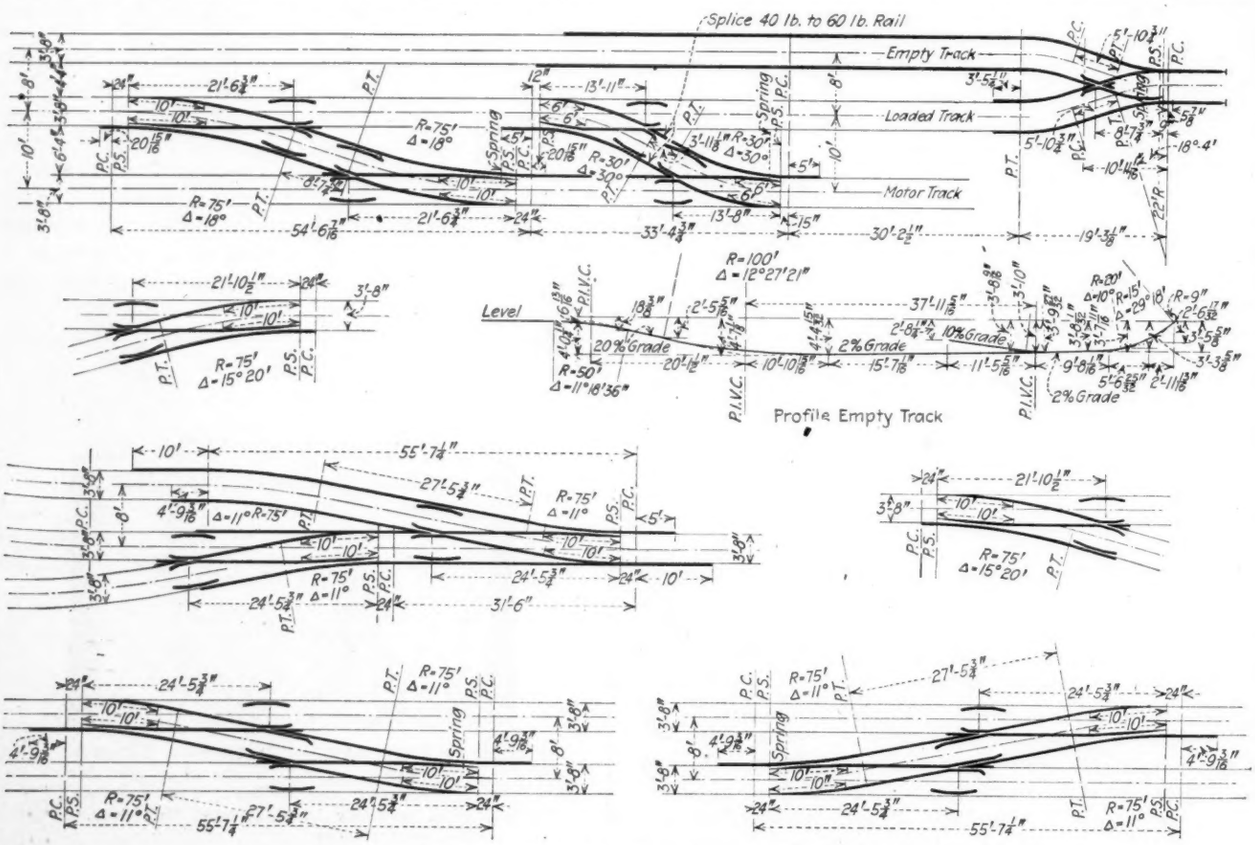


FIG. 1. TIPPLE TRACKS AT MONTOUR MINE NO. 10

This somewhat complicated layout was completely fabricated in the factory and erected on the job.

In beginning a track design the engineer or mine operator is confronted by the question of rail sections. These are in common use in the United States alone about 60 different non-interchangeable sections of rail. These vary in weight from 8 to 130 lb. per yard. Six different sections, properly designed for different conditions would meet every conceivable requirement, thus obviating an economic loss involved in the existing multiplicity of rail sizes which runs into millions annually.

Having decided on a rail section, the selection of connectons at the rail joints must be made. There are about 276 different combinations of holes for rail joints, varying from 2 to 12 in number per joint and making use of from $\frac{1}{2}$ in. to $1\frac{1}{8}$ in. joint bolts. In mining work only four styles of "fishing," or joint drilling, are common. There is no advantage whatever in using more than six for classes of rail and service. The remaining 270 styles are the result of experiments, accidents and differences of opinion.

Local conditions and the rolling stock available determine the gage of track. There are many variations, ranging all the way from 20 to 66 in. but the tendency is to standardize on the gages recommended by manufacturers of locomotives and cars in so far as conditions will permit.

In a general way the type of construction of frogs and crossings is determined by the rail section. It is not possible to secure a satisfactory flangeway depth on rails less than 3 in. high by using fillers between rails, and even on those over 4 in. high the riveted base plate seldom is as strong as the rail. Between 3-in. and 4-in. heights either filled-and-bolted or riveted-plate construction is satisfactory. The riveted construction is somewhat cheaper and the filled-and-bolted more rigid and durable.

For room turnouts of short radius with light rails, where falls of slate or other causes may make it necessary to abandon a piece of track, a frog of semi-steel cast in one piece has been found to be convenient and economical. When buried by débris or worn out, less expense is involved in leaving the frog buried than in digging it out. The cast frog has inherent weaknesses due to its form and is of doubtful economy on light rail work in the alloy or manganese-steel types, because these alloys are costly and of low salvage value.

A combination of frogs, switches, guard rails and curved rails designed and fabricated by the American Frog & Switch Co. for the Pittsburgh Coal Co. is here presented (see Fig. 1) as illustrating the uses of track work at the tipple of the Montour Mine No. 10. The various turnouts and vertical curves were assembled

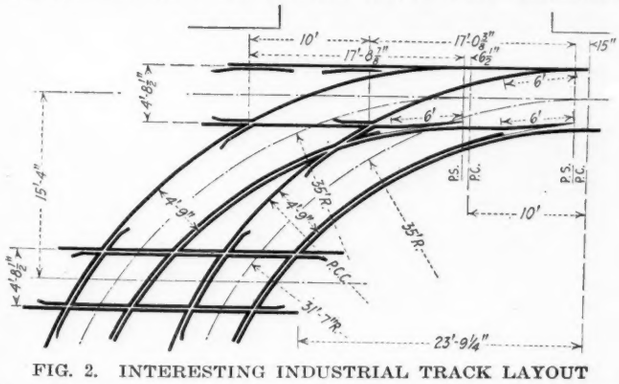


FIG. 2. INTERESTING INDUSTRIAL TRACK LAYOUT

A three-point frog is decidedly unusual yet this layout embodies one, as well as two curved crossovers.

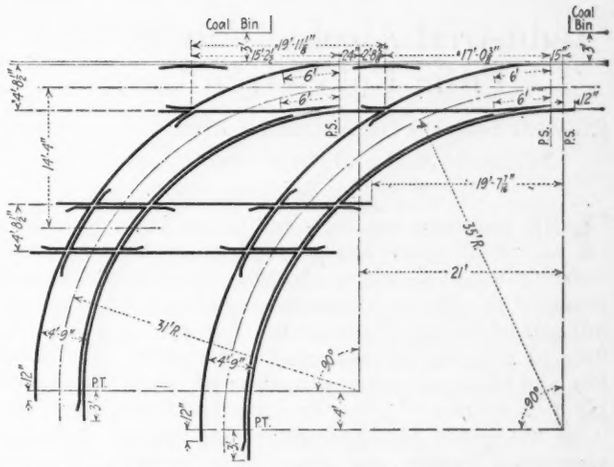


FIG. 3. ANOTHER LAYOUT FOR INDUSTRIAL TRACKS

Guard rails are used on all curves in this as well as the preceding track plan. Their utility is well worth their cost of installation.

complete at the factory and afterward shipped and reassembled at the mine. Both 40- and 60-lb. rails were used while all frogs are of riveted-plate construction.

Several switches are self-closing by springs in order to confine operation of facing-point traffic to one track, while trailing-point traffic may come through at full speed without a switchman. The double guard rails at each frog are essential to prevent derailment, but are replaced by a double-pointed frog in the automatic gravity switchback between "loaded" and "empty" tracks.

A combination of solid bolted crossings, special frogs and switches made by the same manufacturer that furnished the equipment mentioned above, but designed for the charging floor at the United Verde Copper Co.'s smelter at Clarkdale, Ariz., is shown in Fig. 2, illustrating the solution of a track problem in heavy rail. Here the sharp curves are protected by continuous guard rails and the crossings are guarded throughout. The special frog with three points gives rigidity and provides clear flangeways on all tracks.

While a special, complicated layout or crossing is frequently necessary, the great majority of problems are solved by frogs and switches. The manufacturer, if furnished with data on rail, fishing, gage and type of construction, and information as to clearances and special conditions, can meet many a complex track difficulty and provide simple and wreckproof layouts. The mining engineer, if he calls on the designing engineer for suggestions, may save considerable in delays, shop expense and operating troubles. And whoever, by invention or handicraft, permits one man to do what two or more men formerly did, and do it better and more easily, has beyond doubt contributed toward progress, production, profits and industrial peace.

Shares in Illinois Corporations.—A coal or other business corporation may take property appropriated to the corporate objects in payment for shares of stock issued. But payment with property for capital stock is no payment except to the extent of the true value of the property, and if property is taken at an overvaluation the stockholders are liable to make up the deficiency.

Capital stock of a corporation is a trust fund for the security of the company's creditors. (*Illinois Supreme Court, William E. Dee Co. vs. Proviso Coal Co., 125 Northeastern Reporter, 24.*)

Industrial Alcohol Can Be Made From Coke-Oven Gases

Ethylene from the Ovens Can Be Absorbed by Fuming Sulphuric Acid and the Product Hydrolyzed by Water, Liberating Alcohol

THE enormous expansion of the automotive industry in recent years has resulted in an unprecedented consumption of gasoline. In spite of vast increases in crude-oil production, it has been necessary to withdraw millions of barrels of petroleum from reserve stocks. In view of even further increases in consumption of gasoline and the consequent exhaustion of the crude-oil supply, new sources of motor fuel must be found.

In filling the need created by the rapidly depleting motor-fuel supply one can hardly overestimate the importance of motor benzol that may be, and is being, extracted from byproduct coke-oven gas. There is, however, another possible source of motor fuel in which coal men are much interested—alcohol. Its efficiency as a motor fuel has long been known, but not until recently has coal been considered a possible source of that valuable industrial product. Experimentation, in this country and abroad, seems to indicate that a portion of the so-called illuminants of byproduct coke-oven gas may be converted into alcohol. This alcohol may then be mixed with suitable quantities of motor benzol and gasoline, thus decreasing gasoline requirements.

Ethylene and acetylene are the principal illuminating gases in byproduct coke-oven gas that we can convert into alcohol. About 2 per cent of the former is present but only 0.1 per cent of the latter. For this reason the conversion of acetylene into alcohol will not be considered.

The process of recovering alcohol from ethylene is somewhat similar to the present method of extracting benzol. The most satisfactory absorbent for the gas is fuming sulphuric acid or 95 per cent sulphuric acid heated to a temperature of from 60 deg. to 80 deg. C. The ethyl hydrogen sulphate formed in the reaction is hydrolyzed by water, liberating alcohol. The latter is then distilled off by a superheated steam.

The above process will require enormous quantities of sulphuric acid. It is proposed, however, to concentrate the used acid and also to recover the sulphur dioxide lost in the process as well as possibly the sulphur in the hydrogen sulphide of the gas. The recovered sulphur will then be utilized in the manufacture of sulphuric acid.

Sulphuric acid will be needed for the alcohol-making cycle and part of what is used will be lost, but it appears likely that sulphuric acid will for many years be reasonably cheap and readily obtainable.

Assuming a 70-per cent absorption of ethylene and a 70-per cent conversion to alcohol, a yield of 1.5 gal. of absolute alcohol per ton of coal may be obtained. The annual carbonization in byproduct coke ovens of, say, sixty million tons of coal in this country, therefore, will produce ninety million gallons of alcohol, quite a fair sized product to be reckoned with.

This project is quite feasible, although it may not seem so at present. It may may be compared, however, with benzol recovery in America, which was practically unknown less than ten years ago. It brings home forcibly the profligate waste of the valuable ingredients of coal, which should be checked at once. Our petroleum resources will be gone long before our coal, and sooner or later we will have to save all the hundreds of valuable constituents from the coal that we use.

Makes Boiler-Feed Water Pure By Distillation

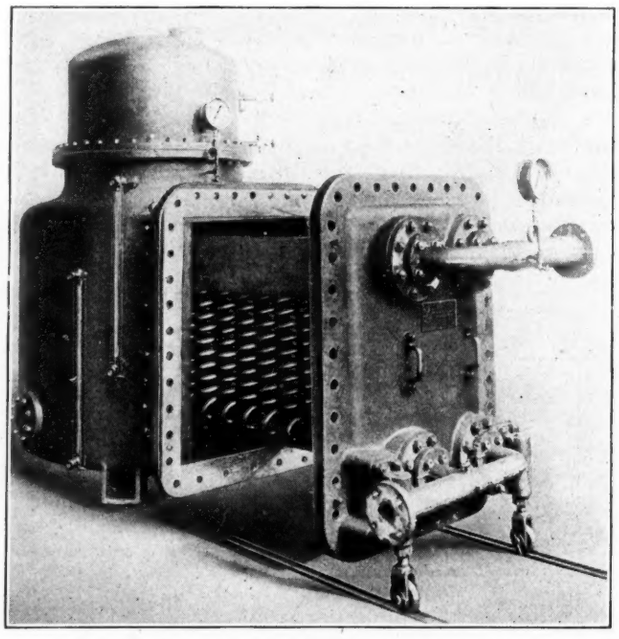
Heat Used in Distillation Is Returned to the System—Eliminates Boiler Scale and Saves Blow-off and Other Heat Losses

A LOCOMOTIVE taking water from a tank, as it has to do every hundred miles or so, is a familiar sight. This replenishing of water is necessary also on ocean-going steamers, but there are no friendly fresh-water tanks located at intervals in the ocean at which a ship can call and receive the necessary supply of water. Sea water cannot safely be used in boilers, so every ocean-going ship carries apparatus that purifies the salt water and makes it suitable for steaming purposes.

This necessity led to the development of evaporators. The type of apparatus at first used was extremely crude, but constant improvement has been made in the art until today we have devices of this kind that not only provide a constant pure supply of boiler feed but also furnish water for drinking purposes. The difficulty with the earlier types of evaporators arose from the scaling of the evaporating surfaces, but the submerged type of evaporator, now frequently employed, is actually self-scaling. This is a long step forward.

For over fifty years feed water has been distilled at sea, but stationary power plants did not use distillation to any extent till about five years ago. Many great power-plant advances have been initiated and fostered in marine work because marine conditions demand high-grade equipment, minimum shutdowns and maximum ease of repair.

A ship at sea is its own repair shop and the repairs must be minimized in order to insure constant operation of the ship's equipment. However, from time to time some of these marine products have been adopted in sta-



WATER EVAPORATOR WITH COVER REMOVED

One sure and positive method exists for purifying boiler feed water—distill it. This device accomplishes that result.

tionary power plant practice, and the past five years has seen the introduction of Reilly evaporators for purification of boiler-feed make-up in large central-station plants, as well as in plants of various sizes—even some extremely small ones.

This purification is accomplished in a similar manner to the established ship-board procedure with the exception that the refinements of operation are even greater, and plants are so arranged that practically all of the heat used in the evaporation of the water by the use of steam is returned to the system. In the actual operation, high-pressure steam is supplied to the coils of the evaporator, and in condensing these coils evaporates the body of water in the shell surrounding them.

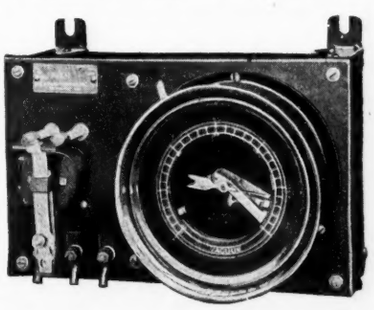
This purified vapor is in turn condensed and is ready for boiler feed. This is descriptive only of the basic feature of the plant, and it is the plan of utilizing the contents of the hot-well as the condensing water and other features which make the system not only a valuable means of purification but also permit the apparatus to pay for itself in actual saving in from six months to one year.

The pioneers of the development of evaporators for marine service were the Griscom-Russell Co., of 90 West St., New York. This firm has been manufacturing this type of equipment for more than fifty years, and was also a pioneer in the development of the "high-heat level evaporator plant" for stationary power houses. This latter development, even though a revolutionary one, has come to stay. The particular features which commend it to the plant owner are that it provides pure water, eliminates scaling in the boiler tubes, eliminates the necessity of blowing down the boilers, and that it actually pays for itself in a short time through the heat saved.

A Regulator for Motors on Pressure Systems

Provides Automatic Means of Controlling Pilot Circuits of Starters for Pump or Compressor Motors

TO REPLACE its former types of alternating and direct-current gage-type regulators the Cutler-Hammer Mfg. Co., of Milwaukee, Wis., is manufacturing a new type of pressure regulator. The new device consists of a pressure gage and relay mounted on a slate panel carried on a wall-type frame, and may be used on either direct or alternating circuits. The manufacturer claims that it is more durable and cheaper than the former types of regulators. This device is used as an automatic starter employed with motors operating pumps, compressors and the like. It can also be used on pressure systems above or below atmosphere. As the pressure falls or rises the needle indicator in the pressure gage makes contact with one of two adjustable contact points, thereby starting or stopping the motor. The two contact points can be set as close as 5 per cent of the total reading shown on the gage, and yet give practical results. They are accessible for adjustment through unscrewing the glass cover of the dial.



PRESSURE REGULATOR AND RELAY

A simple device to so regulate the motor as to automatically hold the pressure (or vacuum) on any system between predetermined limits.

The pressure inlet hole in the gage cover is tapped for ⅜-in. pipe. The gage can be supplied with dials reading in various capacities. Gages for ammonia service are of material that resists ammonia fumes.

The relay used in connection with the gage has solid copper contacts and will operate on either direct or alternating circuits. The relay provides low-voltage release and will operate to start the motor when the voltage returns.

Pressure regulators of this type must always be mounted in a vertical position and should be connected to an independent pipe from the pressure tank or else to the discharge line from the pump, with an air chamber interposed between to prevent the fluctuation in pressure reduced at each stroke of the pump from seriously affecting the gage needle.

New Drill-Steel Sharpener Has 200 Uses

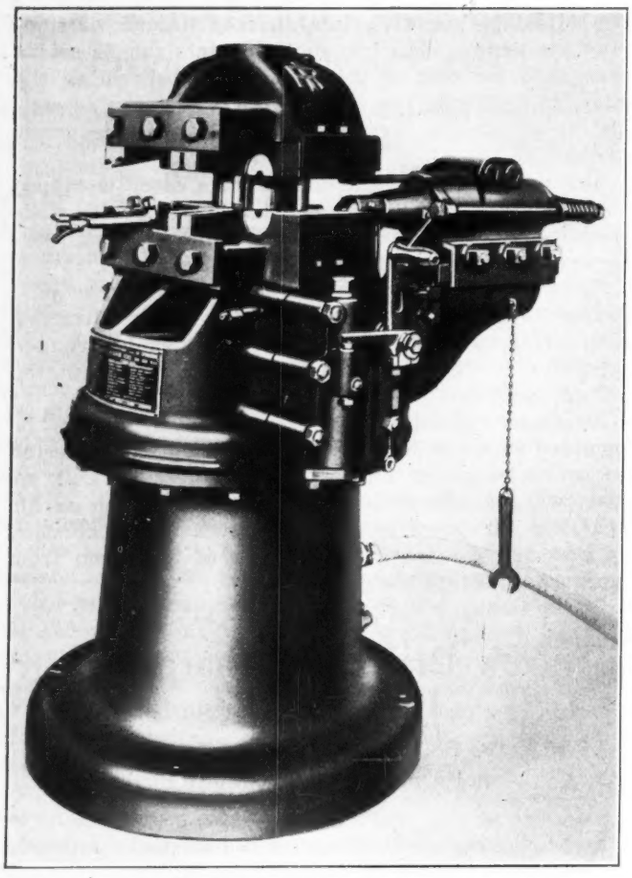
Will Forge Bolt Heads, Pins and Stanchions and Sharpen Drill Steel of Many Sizes and Shapes

A NEW compressed-air-operated drill-steel sharpening machine known as the I-R No. 50 sharpener has been developed by the Ingersoll-Rand Co., 11 Broadway, New York. This machine was designed primarily to rapidly and accurately sharpen and shank drill steel such as: Cruciform steel up to 2 in. in diameter, or round, hexagon, octagon, quarter-octagon auger or spiral steel up to 1⅞ in. in diameter. However, it has performed so many other tasks that the name "drill-steel sharpener" is almost a misnomer. When fitted with special devices it will force bolt-heads, pins, stanchions, etc.; in fact, nearly two hundred different products have been made by this machine.

The single lever which controls all of the operations of the machine is fitted with a safety locking device. This prevents accidents because of the impossibility of operating the machine unless the lock is released. The throttle valve, which is of the balanced spool type, operates easily and quickly and is positive and instantaneous in its action.

The hammer cylinder is an improved valveless type of hammer-drill cylinder. This construction permits the free-moving hammer to deliver exceedingly rapid and powerful blows against the end of the dolly, upsetting the steel, thus forming the bits and shanks with extreme rapidity. This may be more easily understood when it is stated that its capacity is about 20 per cent greater than the Leyner No. 5 sharpener.

The base must have sufficient strength to withstand the severe stresses and shocks met with in everyday work. Sufficient attention has not been given to this in the past, with the result that base breakage—while not usual—was all too common. A glance at the accompanying illustration will show how substantial and rigid the base of this machine has been made. It needs no foundation with the exception of a few planks to level it properly and need not even be bolted rigidly to them.



IMPROVED DRILL SHARPENER

In addition to sharpening drills this machine may be employed for heading bolts, making machine bits and for many other purposes.

Poor lubrication in the case of sharpeners is due most frequently to the ordinary exposed sight-feed lubricator being accidentally damaged or broken. The No. 50 sharpener has no sight-feed or other exposed devices of this kind. Efficient and positive lubrication is provided for the entire machine by the Ingersoll-Rand "Heart-beat" lubricator. This is embodied in the throttle valve chest casting and works automatically whenever the machine is in action. It is provided with adjustment for regulating the quantity of oil desired.

Every part of this machine is made for long, hard, continuous service. An example of this is the absolute elimination of all cup leathers; only accurately machined snap piston rings are used. This means much to the man who has used a sharpener.

E. J. Mehren to Investigate European Conditions

E. J. Mehren, editor of *Engineering News-Record*, sailed for Europe on the "Adriatic," April 24. He will study conditions in the civil engineering field in England, France and Germany and will be abroad until the latter part of August.

Mr. Mehren has also been appointed special agent for the U. S. Bureau of Public Roads, in order to secure certain information while abroad for that organization. Mr. Mehren in his travels will keep in mind the interests of *Coal Age* readers in the export of coal, and on his return will give the editors of this publication the benefit of his observations.

Dump Cars and Dump Wagons as Aids in Coal Stripping

Where Stripping Coal Is Loaded Direct into Railroad Cars Sidedump Equipment Can Be Used for Clearing Up Shovel Wastes

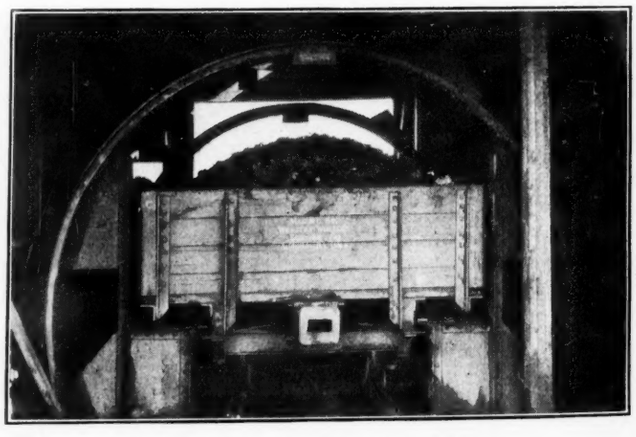
AN acute labor situation and the need for increased unit production present the coal operator with a problem that must largely be solved by machinery and equipment. Where coal stripping is practicable this problem is at least partially so solved. In the Pittsburgh-Hanover operation at Hanlin Station, Pa., for example, thirty-seven men with steam shovels have been getting out as much coal as 300 men ordinarily would mine by undercutting. At this operation some 9,000 cu.yd. of spoil is handled, and about 2,400 tons of coal is loaded each day in two working shifts.

It is the purpose of this article to describe two somewhat novel applications of equipment to the coal operator's problem—one for the elimination of waste and the other for the increase of production. The device for the conservation of coal seems to have originated at the Parlette stripping of the Wayne Coal Co., and it has since been adopted by the Pittsburgh-Hanover people; possibly by others. In steam-shovel loading scattered heaps and chunks of coal unavoidably are left by the dipper—to be covered, in ordinary operation, by the stripping shovel in making its next cut.

At Parlette the experiment was tried of picking up this scattered coal by hand, throwing it into Western dump wagons and then trap-loading the salvaged fuel into railroad cars. The experiment proved so satisfactory that in a single year 700 cars were thus loaded with coal that otherwise would have been wasted. This was accomplished at a cost of 75c. per ton. Moreover the salvaged material was hand-picked coal, commanding the highest market price.

An installation designed for obtaining maximum production and saving labor is that of the R. L. Culbertson Coal Co. at Cadiz, Ohio. A few equipment details may prove interesting.

A well-constructed 36-in. gage track of 90-lb. steel comes out of the strip pit, curves on a 100-ft. radius and continues on a 3-per cent grade through a dumping shed. Here is installed a rotary dump that tips a loaded



COAL CAR IN ROTARY DUMP

With swiveling couplings, car after car of a trip may be discharged without uncoupling.

TRESTLE TO PERMIT CAR LOADING

Odds and ends of coal pushed to one side by the loading shovel are loaded by hand and discharged to the car from dump wagons.

car upside down and spills the coal into a bin holding about 40 tons. The objection to the rotary dump as a substitute for side-dump cars, of course, is the cost of moving the extra weight involved. It is claimed in this case that the speed gained makes the rotary dump profitable and that there is less breakage of coal.

The cars used are of 5-cu.yd. capacity, specially built by the Western Wheeled Scraper Co., without the side-dump feature. The cars are so low in consequence that when loaded the crown of the coal stands even with the box of a standard 5-cu.yd. dump car. The loads, in two trips of eight cars each, are pushed up the 3-per sent grade and through the dumping shed. The small locomotive is then detached and the cars are permitted to roll back by gravity through the rotary dump. Each car in turn is spotted in the revolving cage and held there long enough for it to be inverted and righted again. The cars are fitted with swiveled couplers and in this way an entire trip can be dumped quite rapidly, one car at a time, without uncoupling.

The maximum haul is one-half mile and the average is about a half of the distance. The two small locomotives are supplied with coal from improvised tenders made from standard 5-cu.yd. dump cars. From the bin under the rotary dump the coal is fed by a reciprocating feeder onto a 48-in. conveying belt and picking table, 181 ft. long. This travels at the rate of 100 ft. per minute.

As the coal passes along six or eight men pick out the foreign material and throw it down a chute. By suitable arrangements at the tipple, coal can be loaded into railroad cars below as slack, ¾-in. and 2-in. coal, or the whole output can be switched to another belt, sent through a crusher and reduced to the required size at the rate of 250 tons per hour.

Small Portable Electric Hoist With New Features

Machine Is Simple in Design, Economical, Easy to Control, Readily Lubricated and Effectually Safeguarded

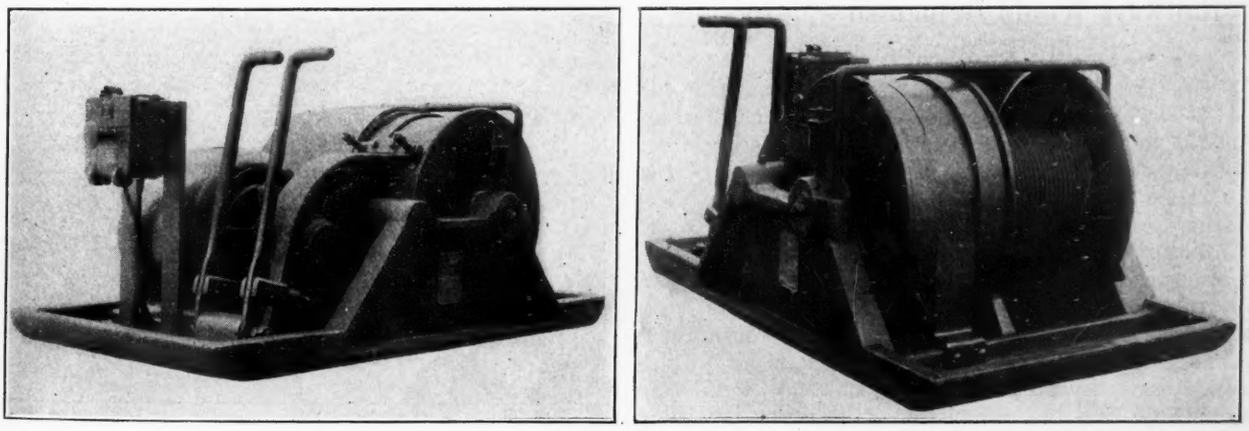
CONSTANTLY increasing use of electricity in coal mining has resulted within the last few years in the development of small portable electrically-driven hoists for moving mine cars in rooms, headings, etc., with greater ease and economy than could be done by man or mule power. Many of the machines that have been marketed for this work are reproductions on a small scale of larger hoists. Few attempts have apparently been made to design these machines for the particular requirements they are expected to meet.

In room hoists of this kind double-reduction spur gearing has been commonly employed in conjunction with a simple form of positive clutch. The Cherry Tree Machine Co., among other manufacturers, had been building a hoist of this type for a number of years, but, realizing the limitations of this design, recently perfected what it has called the "Brownie" room hoist, embodying entirely new working principles. In designing this hoist the manufacturers were guided not only by their experience in this field but by the recommendations of many practical mining men who were consulted as to the requirements of an ideal machine of this character.

Because of the nature of the work it performs and the conditions under which it operates, a room hoist must fulfill the following requirements:

It must be light in weight, so that it may be easily moved from place to place; it must be small and compact, in order that it may be located where desired without requiring extra space; it must be rugged in design and construction and capable of operating satisfactorily under all conditions; its control and manipulation must be simple and effective, so that it may be successfully operated by unskilled workmen, and it must be possible for the operator to vary the rope speed at will. These requirements have all been completely satisfied in the design of the "Brownie" hoist, while in addition special attention has been given to lubrication and the safeguarding of the working parts.

The most important feature of this hoist is the patented type of transmission and control utilized. This control makes possible variable rope speeds, ranging



OPPOSITE QUARTERING VIEWS OF THE ROOM HOIST

Two levers, seen in both cuts completely control all movements of the machine.

between zero and the maximum attainable at the will of the operator, the motion of the rope drum being under absolute control at all times. One advantage of this type of control is that the motor is never started or stopped under load. As a consequence any self-starting motor may be used, a high starting torque being unnecessary. A safety-inclosed switch fully meets all requirements for starting and stopping the machine, thus obviating the necessity of a controller. The compactness of the gearing used in this hoist permits the weight and over-all dimensions to be held to a minimum.

The rope drum is driven by means of a gear train, two members of which are internal spur gears having smooth flanged exterior surfaces arranged to be gripped by friction bands. One of these friction bands may be used as a brake to retard the motion of the rope drum as desired while the other is used as a clutch. The speed of rotation of the rope drum depends upon the degree to which the clutch band is tightened.

The rope-drum speed will be maximum when this clutch gear is held stationary. The brake and clutch bands are each connected to a handle pivoted to the base of the hoist. They thus become the brake and clutch handles respectively, and by their manipulation the rotation of the rope drum is controlled.

Effective lubrication has been particularly considered in designing this hoist, as oiling is one detail in the care of machinery that is frequently neglected in mines. All the principal moving parts of this hoist rotate on the drum shaft, and by making this hollow the lubrication of these parts is effected from one point.

The rope guard employed on this machine is another excellent feature. This guard makes it impossible for the rope to get off the drum, foul, or to cause injury to the operator in case of breakage.

The base and side frames of the hoist are all included in a single grey-iron casting, so shaped as to permit the machine to be easily skidded from place to place and anchored where desired. All parts have been designed with an ample factor of safety; all gears have cut teeth and are guarded to industrial safety committees' standards.

The manufacturers of the "Brownie" hoist recommend it for a maximum duty of 1,500-lb. rope pull, such as would be required, for instance, to haul a total load of 6 tons up a 10-per cent grade. Many of these machines have been placed in service within the last year, and the favorable comments of those using them.

Railways Would Replenish Equipment from Revolving Fund

TO CONSIDER recommendations for the use of the $300,000,000 fund provided in the Transportation Act the Revolving Fund Committee of the Association of Railway Executives held a meeting recently. The Interstate Commerce Commission requested the association to send queries to its members, and the report will be forwarded to the commission soon.

Many railroads lacking large reserve funds are having trouble in financing their equipment needs. Much equipment business is being held back because roads cannot see their way clear to finance orders which should have been placed months ago. Many of the managers hope that the commission will approve spending the bulk of the $300,000,000 for equipment for those carriers.

Ball-Bearing Mine Locomotives Need Few Repairs

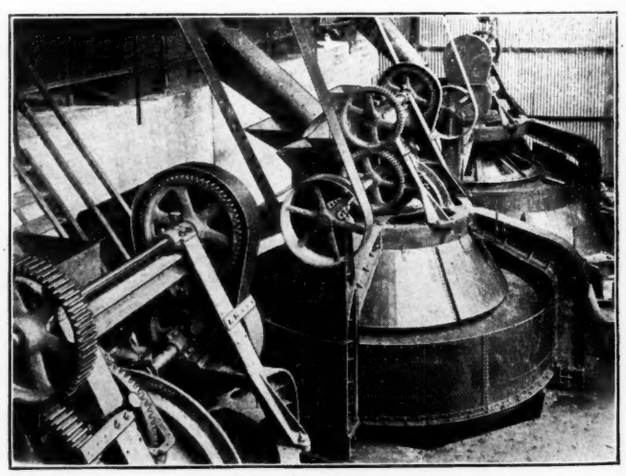
Reliability Under Hard Service, Minimum Lubrication and Little Attention Required Are Material Aids to Heavy Production

INCREASING use of mechanical equipment in mines arises from the necessity of greater production of coal. The steady demand for more coal and the high cost of labor have made it imperative that machinery shall be used whenever possible. To be of real value, however, such equipment must be efficient and reliable.

Systematic and adequate haulage is recognized as one of the most important factors in coal-mine operation. Furthermore, mechanical haulage has greatly increased coal production and improved working conditions. The production possible through the use of mechanical haulage can be appreciated when it is realized that a large locomotive can haul loads up to or even exceeding 400 tons in weight on the level.

The outstanding feature of mechanical haulage, of course, is the use of electric and gasoline locomotives instead of mules, with a resultant saving of around 60 per cent in haulage costs in addition to other advantages. By promoting uninterrupted service, however, the extensive use of anti-friction bearings on mine locomotives has greatly increased their haulage capacity. Electric locomotives are the more popular for mine work, although under certain conditions the gasoline locomotive is extremely useful. Electric locomotives as a rule are provided with two motors, as better results have been obtained with this arrangement than with single-motor machines. In some makes of mine locomotive motors ball bearings have been standard for several years and have been installed on the heavier as well as the lighter machines, for past performance has demonstrated that ball bearings will withstand heavy loads and shocks, that they are reliable under severe conditions and that they require a minimum amount of attention. Mine locomotives being subject to hard service, which imposes severe stresses upon the motor and its bearings, particular attention must be paid to these parts in order to insure freedom from breakdown.

An important feature of ball-bearing motors is the maintenance of a uniform air gap between armature

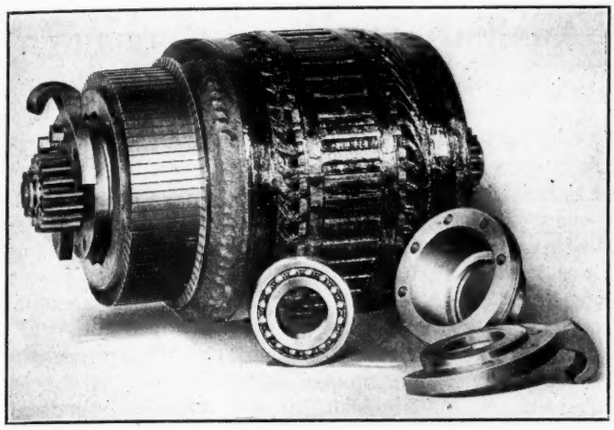


CENTRIFUGAL COAL DRIERS

The use and advantages of ball bearings are by no means confined to the mine rolling stock.

and poles, which insures uniform commutation. The armature never rubs on the pole pieces, and the armature bands and coils are therefore never injured. The proper centers are always maintained, which insures longer life to the gears, as they are always held continuously in proper mesh, as well as higher efficiency.

Plain bearings are subject to a continuous rubbing action, which causes wear on the bearing surfaces, frequently allowing the shaft to settle out of the true magnetic field. This calls for frequent inspection and gaging and constant renewal of the bearing brasses. Repairs of this nature mean extra expense, while the delay involved reduces the earning capacity of the locomotive. Locomotives with ball-bearing motors are rarely out of commission. The output of coal therefore is more nearly continuous, which insures high production. Furthermore the cost of repairs arising from worn-out armature bearings is eliminated.



A LOCOMOTIVE ARMATURE AND ONE OF ITS BEARINGS
Ball bearings have done much to reduce armature repairs.

As ball bearings are almost frictionless they are subject to practically no wear, which accounts for the maintenance of the uniform air gap. Balls and races are of course made of hardened steel and rolling action is substituted for rubbing. Ball bearings at both ends of the armature shaft carry it in perfect alignment and allow it to accept sudden changes of load without binding and consequent heating. The self-aligning bearing insures the best possible load distribution on the balls.

This type of bearing has the inner surface of the outer race ground in the form of a hollow sphere, whose center is in the axis of rotation. Thus all points on this surface are equidistant from the center of the bearing. The balls and inner race are free to rotate at any angle within the spherical outer race without being subjected to undue stresses. The bearing therefore will take care of any spring or deflection that may be found in the armature shaft.

Another important feature of ball-bearing motors in mine locomotives is the saving they insure in lubrication and attention. Ball bearings require little lubricant as they need to be oiled only three or four times a year, the housing being designed to retain an ample supply of lubricant. The end caps are provided with sealing grooves which prevent the oil from leaking out and getting onto the commutator and windings. These parts are thus kept clean and short circuits or grounds are greatly reduced in number. With a clean commutator dust will not accumulate and cause bad commutation.

Car Handling at Valley View Plane

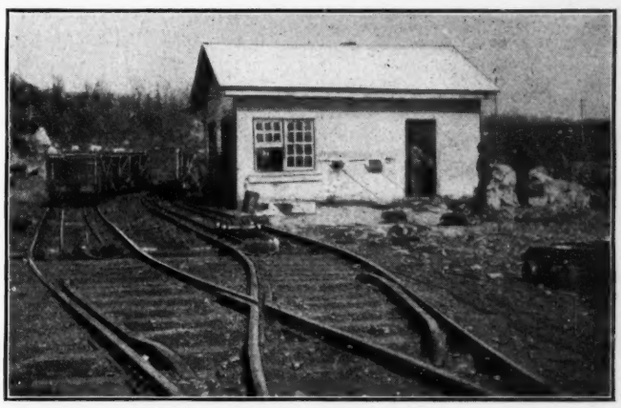
Mine Wagons of 9,000 lb. Weight Are Handled from Head of Plane to Locomotive by Rope and by Barney

BY E. G. MARKLEY
Bangor, Pa.

AN INTERESTING feature of the Philadelphia & Reading Coal & Iron Co.'s plant at Valley View, near Good Springs, Pa., is the unusual method of transferring or handling cars at the head and foot of the new plane. The plane is 2,700 ft. long. On each trip three loaded cars, weighing each 9,000 lb., are hoisted and three empties lowered by a 400-hp. electric winding engine at a speed of about 700 ft. per minute. The cars are transferred to and from the head and foot of the plane by four-drum electric hoists.

FOOT OF VALLEY VIEW PLANE
The barney used for moving cars to and from the incline may be clearly seen in the central foreground.

The breaker is located about three miles from the top of the plane. Empties are brought to the siding and loads taken from it to the breaker by a steam locomotive at the rate of about thirty cars per trip. When a trip of loaded cars reaches the head of the plane an attendant attaches a grip or, as it is here called, a "sling" to one of the cars and also to the endless rope running from the transfer hoist. The cars are then pulled away from the head of the plane to a point just beyond the transfer barney. Here the barney "picks up" the loads and moves them ahead about 150 ft. into position for being coupled onto the locomotive.

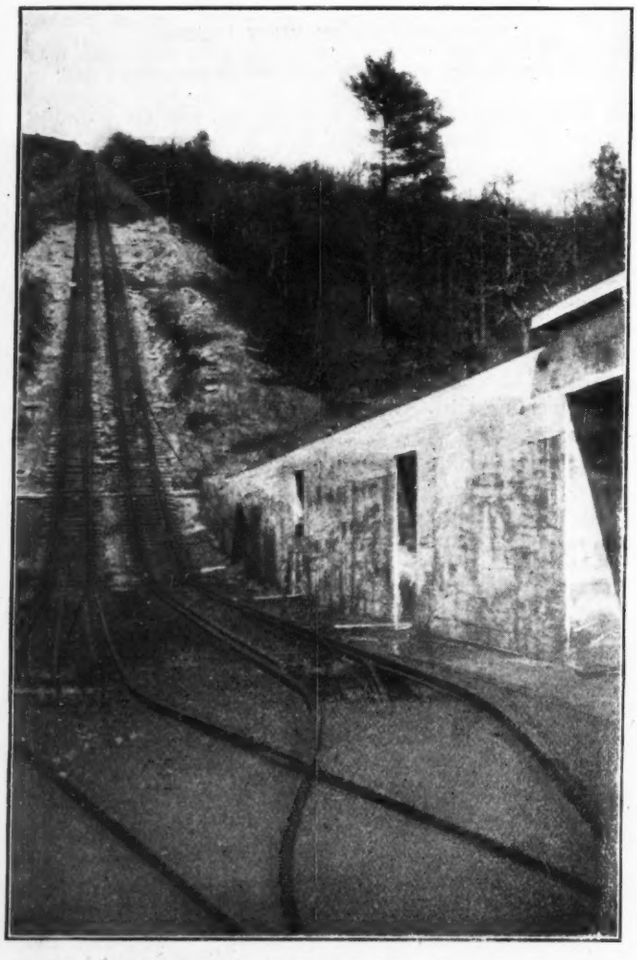


TOP OF THE PLANE
The barney, its rope and track here also may be readily seen.

The empties are brought forward by the same barney upon its return trip, to be transferred to the head of the plane by the transfer rope. As the loads come up and the empties go down the plane upon either side alternately, a crossover switch is necessary. The loaded cars are generally placed on the right-hand switch track ready for removal to the breaker, with the empties on the left for delivery to the plane for lowering.

The barneys travel on auxiliary tracks laid inside of the turnout tracks. They are controlled by friction drums on the transfer hoist. A rope is attached to each barney and they are connected by a rope which passes over guide sheaves. The whole forms a positive reversing mechanism. Throwing one drum into friction, the barney connected to it moves forward and the connecting rope pulls the other barney in the opposite direction, thereby giving the operator any movement desired on the track. A weighted brake on the drums prevents the ropes from running off too freely on the reverse movement.

The endless rope for the transfer of cars to the plane from the barney is operated in practically the same manner, the grip in this case taking the place of the barney. Rings are provided in this rope by means of which the sling, with a hook at one end and a ring at the other, is attached. The ring on the sling is larger than that provided on the transfer rope and consequently will not pass through it. In both cases the two ends of each rope are connected to separate drums on the hoist, making the movement of the rope positive.



VIEW UP THE PLANE FROM ITS FOOT

This plane is 2,700 ft. long, and three loaded cars weighing 9,000 lb. are hoisted at each trip. One of the plane barneys is within its pit.

Two men—one to operate the hoist and the other to handle the car sling—receive and deliver all the cars to and from the plane. The operation at the foot of the plane is practically the same as that described as taking place at its head and the same kind of hoist is used. These four-drum electric hoists were furnished by the S. Flory Manufacturing Co. Similar machines and equipment are in use by the Lehigh Coal & Navigation Co. and the Alliance Coal Co., and the transfer of cars is made at their operations in practically the same manner.

Centrifugal Pumps of Value as Auxiliaries to Meet Emergency

By W. H. Lesser*
Frackville, Pa.

RECENTLY the operating departments of the anthracite coal mines have been called upon to cope with an influx of water in volume and stubbornness seldom, if ever, exceeded. The comparatively few serious suspensions for this cause that took place in producing mines speak well for the installed pumping equipment as well as the machines hastily put in place to meet the emergency.

No doubt all the men in direct touch with the mechanical or electrical department of the mines have been called upon to quickly install pumps in order to prevent some slope or shaft from "drowning out" or to save the main pumping plant. An experience of my own may be of interest and perhaps of some help to others under similar conditions.

Two electrically-driven reciprocating pumps with a total capacity of 2,000 gal. per minute against a head of 800 ft. were unable to handle the water produced in a certain mine, and it became necessary to install an emergency pumping plant. This consisted of two electrically-driven pumps with a total capacity of 2,500 gal. per minute placed on the slope and a pump of the same type in a narrow breast containing the discharge pipe lines from the main pumping plant. This equipment soon "held the water" and prevented a complete inundation of the mine.

When it is stated that the slope was 12 ft. wide and 7 ft. high it will be realized that no other type of steam- or electrically-driven pump with a similar capacity could have been placed in it with the same amount of labor. For emergency pumping in times of high water experience has demonstrated that centrifugal pumps are certainly to be preferred to reciprocating machines.

As to the advisability of using centrifugal pumps for continuous service throughout the year there seems to be some doubt. Few authentic figures are available regarding the relative cost of pumping acidulous mine water by the modern steam-driven, compound, condensing, reciprocating pump, the electrically-driven reciprocating machine or the electrically-driven centrifugal pump. Data regarding these matters, I am sure, will be appreciated by those engineers who are held responsible for the installation and operation of the large dewatering plants common in the anthracite region.

*Mechanical Engineer, Harleigh-Brookwood Coal Co.

Features in Track Planning That Will Aid In Securing and Increasing Output

Entries and Air Courses Are Carefully Planned, but the Haulage System Is Often Neglected—Transportation in Most Instances Is the Neck of the Bottle That Determines the Volume of the Output.

By Charles H. Partington
Cincinnati, Ohio

BEFORE track is laid insufficient thought is too often given to its proper planning, and frequently after it is put in place the track is grievously neglected. Some people seem to think that anything is good enough to pull cars over. The fact is that speedy uninterrupted dispatch of loaded cars to the cage, as well as a prompt return of empties, is the main factor in securing large production. Strange it is then that little or no attention is given to the perfection of the haulage system, the track equipment and its design. To illustrate this the following data are offered, which I hope will prove of interest and assistance to mine operators, superintendents, foremen, trackmen and the like.

Before a shaft is sunk one of the important items to be considered is how coal can best be brought to it in large tonnage after the main entries, cross entries and air courses have been driven. Until development has made some progress, the amount of coal taken from the rooms is, of course, small, and the meager tonnage of coal produced can readily, and is generally, hauled upon temporary track. This makeshift arrangement is usually followed after a short while by the installation of heavier trackwork, quite usually, however, without proper thought being given as to how the cars are going to be handled. As a consequence at many a mine improperly located cross entries and intersections are revealed having branch-offs interfering with proper placing of turnouts, crossovers, etc. This results in cramped installations of trackwork, short radii for curves, inefficiency in trip making and dilatory placing of cars for caging and an ineffective distribution of empties.

Proposed mine development usually is carefully plotted and planned, but it is seldom that the haulage system is considered at the same time. An illustration of how a layout was actually made and how it should have been constructed, if proper consideration had been given the problem before construction was commenced, is shown by Figs. 1 and 2. In making such a design the trackwork must be plotted to a small scale because of the large area to be covered, and consequently such drawings are not carried farther than the beginning of the development of the rooms. Much can be done to handle

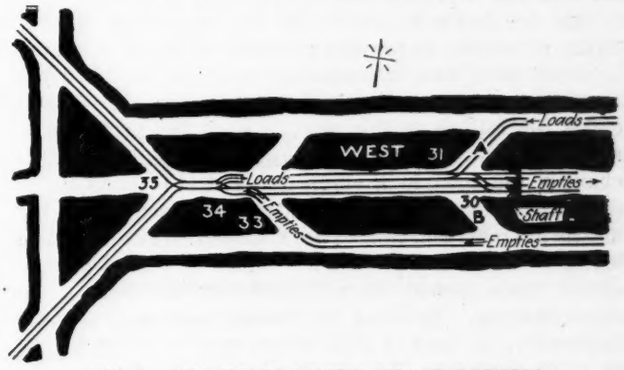


FIG. 1. POORLY-PLANNED SHAFT BOTTOM
Track facilities are so congested as not to afford adequate means for switching the locomotive.

cars effectively beyond the points shown, but, owing to the lack of space, the plans for such additional track must be omitted.

Fig. 1 is a map showing a development planned without any consideration of the track layout. True the method of handling cars to and from the cage was predetermined but no consideration was given to the problems involved in the installation of track, especially with regard to the space which the track facilities would require. This resulted in the unavoidable installation of short curves, short-lead turnouts and jammed crossovers. Cross passages between main and side entries were driven without any regard to the position they should properly occupy for the effective placing of track and handling of cars.

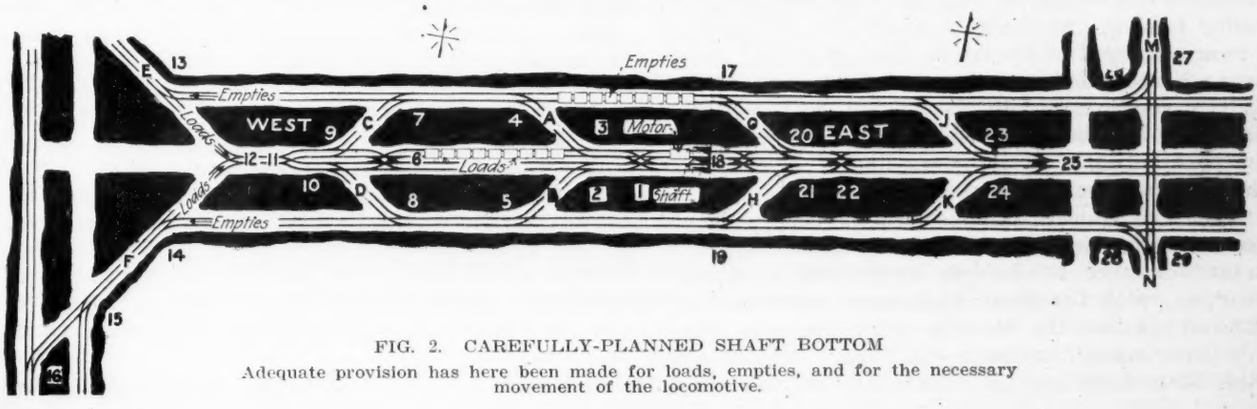


FIG. 2. CAREFULLY-PLANNED SHAFT BOTTOM
Adequate provision has here been made for loads, empties, and for the necessary movement of the locomotive.

Beginning our investigation at the foot of the shaft we see that the loads are delivered to the cage from the west side. It is obvious at once that the first cross entries, "A" and "B," were located too close to the shaft. Turnouts installed at the intersection choke off the space available for the double crossover, which not only necessitates that this be built with curves of small radius but leaves no room for passing the locomotive to a free space between the crossover and the cage.

Short radius in a cross-over means improper construction, short switch points and the binding of car wheels, and this results in the use of extra power and retards the movement of cars to the cage. As the main function of the cross-over is the delivery of loaded cars either to the right or the left cage, as desired, a space should be provided to enable the locomotive to pass beyond the cross-over switch and return by way of the opposite track without difficulty or loss of time. Placing the cross-entry switches improperly gives the motorman little chance to return the locomotive to the rooms for another trip, and that spells delay.

The double-track system in the main lead greatly tends, of course, to prevent congestion, but if too much is expected of this arrangement and the double track is not laid out properly, it will prove useless. A common cause for failure in this particular is the provision of an insufficient length of double track. The double road changes too soon to a single track or the handling of cars may be crippled by inadequate space being left between cross entries. The cramped space resulting leaves no room for placing a number of loaded cars on either track, hence there is difficulty in keeping the cages moving. Shifting the loaded cars is practically impossible, as there is little or no room to accommodate an extra crossover.

The angle at which the cross entries are driven is often responsible for lack of space. If the direction of the cross headings in which track is to be placed is given proper consideration an important gain in space will be made where they intersect the main leads and this will be secured even without changing the position of their starting points in the side leads. With a distance of even 30 ft. between the leads and with cross entries cut at 45 deg. it can readily be seen that a gain of 60 ft. is possible if the angle of the cut is modified. Thus more cars can be placed in line and continuous cage feeding secured.

Ten or twelve cars in a string may be sufficient to meet the needs during early development but when the mine has reached such a size that cars are being assembled from a large number of rooms additional space is demanded because several loads will have to be accommodated on the landing. With no space available, caging is slow, and the only alternative remaining is a re-arrangement of the track. This may work out to some advantage, but in most cases it proves only a makeshift in comparison with the efficient haulage system that might have been planned in the first instance before the possibilities of design were limited by the work already injudiciously performed.

When the transportation system is poorly planned locomotives are held idle on sidings or on passing tracks. In many instances this hold-up is considered a necessary condition, with the result that more locomotives are installed to relieve the idle ones, only to reveal later that this extra expenditure helps but little. Two and even three locomotives are not infrequently required to do the work that could be accomplished by one if due attention had been given in the beginning to the gathering and placing of loaded cars and to means whereby locomotives could be enabled to go back without delay for other trips.

Not only may the track system cause trouble but the track itself may be of poor design and delays will be experienced because of the binding on curves of cars and locomotives, the frequency of derailments, and other like difficulties. Short switch points, lack of alignment, absence of guard rails or their wrong position all contribute to the difficulty in keeping things moving. Short-radius curves and especially those with reverses put an extra load on the locomotive, which, although capable of pulling fifteen cars on a straight track, may be held down to four or five when bad curvature is encountered. The strain thus placed on the locomotive and the added number of trips that this strain entails mean waste of power and loss of time.

Careful consideration of the tonnage to be handled will enable us to avoid troubles of this sort. The larger the output we desire to attain, the more space it is necessary to provide for the stringing of loads and empties, for locomotive returns, for passing tracks, and for other purposes, and in this connection reference to Fig. 2 should be made.

As already stated, the first consideration in laying out the tracks for loads is to provide a space between the crossover and shaft sufficient to accommodate the locomotive and allow the switch to be thrown for its transfer to the opposite track. The cross-over should have curves of large radius so as to allow the locomotive to pass over it easily and to permit of the pushing of cars by hand. Sufficient distance should also be provided to turnouts Nos. 2 and 3 to allow cars that are being pushed into the main leads to straighten before entering the switches. The angle of cross entries "A" and "B" should be in the direction shown, for if cut in the opposite manner it would be necessary for the locomotive after passing over the turnout to back-track in order to get to the side leads.

Layout Is Adapted to All Conditions

A string of nine loads is shown, but this number can be increased by arranging in the beginning for a greater distance from turnouts Nos. 2 and 3 to crossover No. 6. The limits of the diagram prevent showing a larger trip.

This trip is left standing on a straight track, the grade of which assists in the delivering of cars to the cage, while the locomotive has room, if necessary, to return over the crossover and through cross entry "B." As shown, however, it would only be necessary to pass over turnout No. 3, then back through entry "A" and pick up empties where shown. These empties can then be hauled straight ahead through turnout No. 13 and along entry "E" to rooms, or by passing through "C" and over turnouts Nos. 11 and 12, delivery can be made to entry "F."

Crossover No. 1 not only serves for the return of the locomotive but is useful in sending loads alternately to the left or right cage from either of the straight storage tracks beyond crossover No. 6. The latter serves the purpose of splitting trips to load both tracks for delivery to the cage. Should it be necessary to get the locomotive to a point behind the loads, crossover No. 6 again comes in handy.

If there is no question as to placing the loads for the

cage, the proper track is easily approached by means of turnout No. 11. Turnouts Nos. 9 and 10 should be placed at such a point as to allow the laying of a straight section of track similar to that which has been planned and provided in the case of turnouts Nos. 2 and 3. This provision should be made at any point where curves precede the beginning of a turnout. Care also should be taken to give sufficient room at the rear of frogs to insure that the joints will be kept clear of switch points.

The above explanation and description of the simple haulage system illustrated could be greatly lengthened, but with the salient features set forth there should be little or no trouble in planning the methods to be followed in meeting similar problems. After a little study of the diagram, numerous possibilities in the handling of imaginary trips of loads, caging, returning the locomotive, replacing, gathering empties, etc., will be revealed. No claim is made that such a layout as this will be ideal or meet all conditions, but as a sample case I hope it will prove helpful to those contemplating the installation of new haulage systems or the replacement of old ones. Cross-overs and turnouts can be shifted, taken out or put in, as may be necessary to suit individual needs.

The portion of the diagram showing the delivery side of the shaft and the return of empties deserves consideration also, as conditions here are not the same as those governing loads.

The first cross-over, No. 18, serves the purpose of delivery to either track and as no locomotive is required here, extra space near the shaft for a locomotive cross-over is not required. The importance of large radii applies here for the reason that most of the transferring is done by man power, and the binding resulting from the use of short curves must be avoided. The width of radii for turnouts Nos. 20 and 21 also should be controlled by the same consideration, as it may be necessary to direct the empties to the side leads by man power also.

The other turnouts shown may be utilized to take care of the locomotive transfers, the collection of empties and the distribution of loads from the return side to the caging side.

Application of the main principles involved in the diagram shown will form an excellent foundation for any haulage system. The initial work should be preceded by proper consideration of each detail, and the time spent in planning as well as the cost of the track equipment will prove well worth while. Detail work is absolutely essential and drawings must be made accurately to scale, for if dependence is placed on sketches trouble is sure to result.

The size of cars and locomotives as well as the dimensions of wheels, wheelbase, etc., all enter into the solution if distances and curves are to be properly provided for. The engineering department of the firm* with which I am connected has had much experience with both large and small systems, new and redesigned, and is therefore thoroughly familiar with the details involved. Special attention is given to the design and construction of mine track. Proper consideration of mine haulage seldom fails to yield gratifying results.

*The Cincinnati Frog & Switch Co.

Effective Hot-Process Water Softener

Most Chemical Reactions Proceed Much More Rapidly at High Than at Low Temperatures—The Hot-Process Softener Thus Accomplishes Results Much More Rapidly Than Cold-Process Systems

IN ITS present form the hot-process softener is a recent development. By taking advantage of the fact that chemical reactions are more rapid and complete in hot water than in cold it claims to secure a more efficient removal of the scale- and sludge-forming substances in water than is otherwise obtainable. The apparatus performs the functions of the open feed-water heater usually found in boiler plants, in addition to those of a softener. Less space, lighter foundations, less housing, less piping and fewer fittings are thus required than for a cold-process softener, with which an independent heater is necessary.

There are several reasons why scale-forming matter is more completely removed from hot water than from cold. In most instances chemical reactions are much accelerated by heat. This is a well-known and generally recognized fact, and was taken advantage of in households for ages before it assumed the dignity of a law of chemistry. Everyone knows that dishes and clothes are washed more rapidly and thoroughly in hot water than in cold.

The exact law connecting temperature and rapidity of chemical reaction has never been determined accurately, some chemists stating that the speed of reaction doubles for each 10 deg. C. added to the temperature, and others that chemical reactions are speeded up approximately as the 20th power of the absolute temperature. These formulas are not in agreement, but everyone concedes that there is as a rule an appreciable increase in speed of reaction with a rise in temperature.

Some years ago experiments were made in the chemical laboratory of the Harrison Safety Boiler Works to determine the effect of temperature upon the reactions which take place between softening reagents and scale-forming matter in boiler-feed water. The results are shown graphically in Fig. 1.

It will be seen that the reduction in hardness—that is, in content of calcium and magnesium salts—is much greater at the end of 10 min. in water at 210 deg. F. than at the end of 5 hr. in water at 50 deg. F., in fact, a 24-hr. treatment in cold water does not bring the scale-forming matter down as much as does a 10-min. treatment in hot water. Subsequent heating to the boiling point of the sample which had stood at 50 deg. F. for 5 hr. reduced the magnesium hydrate to less than one grain per gallon, but the same result was obtained in hot water in 10 min. In performing these experiments only a sufficient quantity of softening chemical was added to completely combine with

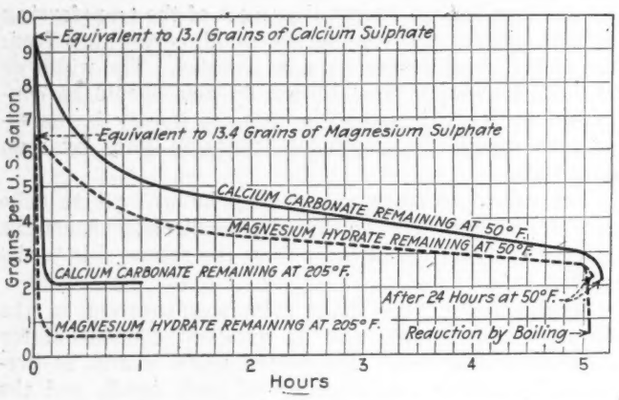

Equivalent to 13.1 Grains of Calcium Sulphate
Equivalent to 13.4 Grains of Magnesium Sulphate
CALCIUM CARBONATE REMAINING AT 50° F.
MAGNESIUM HYDRATE REMAINING AT 50° F.
CALCIUM CARBONATE REMAINING AT 205° F.
After 24 Hours at 50° F.
MAGNESIUM HYDRATE REMAINING AT 205° F.
Reduction by Boiling
Grains per U. S. Gallon
Hours

FIG. 1. ACTION OF HEAT ON THE SOFTENING PROCESS
Ten minutes in hot water is more effective than five hours in cold.

the scale-forming substances. In practice a slight excess is used, which reduces the hardness to still lower figures.

The effect of heat upon chemical reactions can be verified in a rough way by performing the following experiment: Place one pint of cold, untreated boiler-feed water in each of two beakers; bring one of them up to the boiling point, but allow the other to remain cold. Add to each the amount of reagent theoretically required for transforming the scale-forming substances. Stir thoroughly the contents of each beaker and note results. The reaction and sedimentation in the hot water will be much more prompt than in the cold water.

After precipitation has ceased in the cold water, decant the clear liquid and heat it to the boiling point. A marked after-precipitation will result, showing that the reaction in cold water was not complete. Do the same with the clear liquid from the hot-water beaker. No after-precipitation will occur. It is thus conclusively shown that the reaction is not only more rapid in the hot water but is also more complete.

The substances which result from the transformation of scale-forming matter are more nearly insoluble in alkaline hot water than in cold water, hence less of these substances are carried into the boilers in solution by water which has been softened hot.

The precipitates resulting from the transformation of scale-forming substances settle more rapidly and completely from hot water than from cold. Solid particles suspended in water settle to the bottom if their density is greater than that of the water; they rise to the top if their density is less than that of the water. The force tending to draw a particle downward is its weight less the weight of water displaced, and the force by which this descent is resisted depends upon the extent of the surface of the particle, the viscosity of the fluid in which the particle is suspended and the velocity of fall. Of course, a velocity is soon attained such that the force resisting the fall is built up till it prohibits further acceleration, and a uniform rate of settling results.

At the freezing point the viscosity of water is over six times as great as at the boiling point, and the velocity of fall at 212 deg. F. will be four times as great as the velocity at 68 deg. F.

Now consider how this applies to what takes place in a water softener. Suppose we have a large tank full of absolutely quiet water. A particle of any given size will descend four times as far in an hour in hot water as it will in cold water.

Next, suppose we have a continuous softener in which the water is constantly flowing through the sedimentation tank. In a hot-process softener a rate of flow can be allowed which is four times as great as is permissible in a cold-process softener without particles of a given size being carried to the pump supply pipe. Or, to put it in still another way, with a given rate of flow through the settling chamber much smaller particles can be separated from the water in the hot-process than in the cold-process softener. The further fact that the particles formed in a hot-process softener are larger than those formed in a cold-process softener renders the advantage of the hot process still greater, since the velocity of fall increases as the square of the radius of the particles.

It is therefore plain why the preliminary heating of the water, a feature peculiar to the hot-process softener, gives more complete chemical reactions and more thorough removal of the resulting precipitates.

The completeness with which scale-forming matter is removed from water treated in the hot-process softener may be shown by the following analyses of water before and after treatment in a commercial installation. In considering these results it should be borne in mind that a grain is $\frac{1}{7000}$ of a pound, or $\frac{1}{58,415}$ of the weight of a gallon of water. The small amount of solids remaining in the treated water coming from a hot-process softener does not form scale in the boiler, but gathers as sludge, which is easily blown out:

	Grains Per U. S. Gallon Before Softening	After Softening
Calcium sulphate	13.00	none
Calcium carbonate	12.30	0.36
Magnesium carbonate	5.36	0.94
Silica	0.82	0.35
Iron and aluminum oxides	trace	trace
Total incrusting solids	31.48	1.65
Organic and volatile	6.32	2.98
Sodium carbonate	.....	4.80
Sodium sulphate	0.64	12.60
Sodium chloride	2.28	1.92
Total non-incrusting solids	9.24	22.30
Free carbonic acid	2.45	

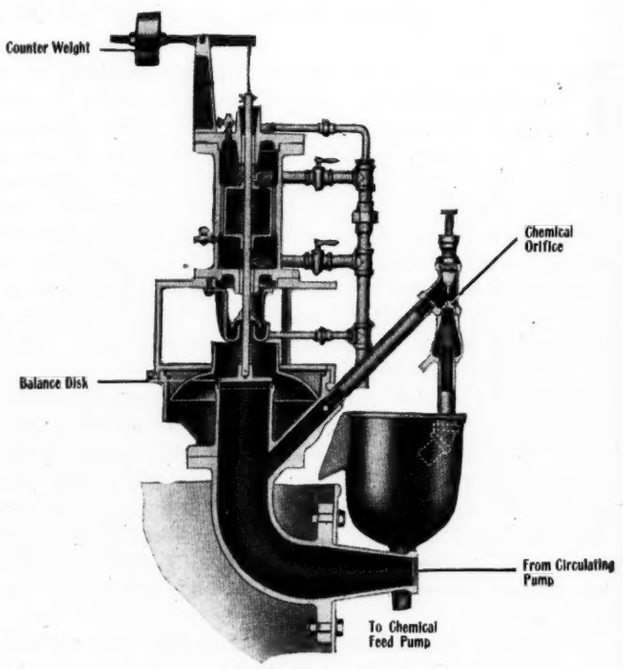


FIG. 2. CHEMICAL PROPORTIONER
This device, accurately, automatically and in proper proportions, feeds chemicals to the softening apparatus.

The chemical reagents must be fed to a softener in accurate proportion to the amount of water and to the impurities contained therein, so that the treated water may not deposit scale on the one hand or contain an excess of the unused reagents on the other. For proportioning the reagents to the raw-water supply various mechanical arrangements have been devised.

In some softeners the raw water flowing to the softener turns a wheel or operates a tilting bucket, which in turn operates dippers by which the reagents are ladled out to be mixed with the raw water. Such appliances, widely used with cold-process softeners, are usually located above the reaction chamber of the softener, involving the lifting or hoisting of the reagents 15 or 20 ft. or more above the ground level.

In other softeners a certain portion of the water, divided from the main supply by means of orifices or weirs, flows through chambers containing the reagents. In such a proportioner the water in flowing through the reagent tank becomes saturated. This method is faulty, however, since solubility varies greatly with temperature.

In another form the water displaces the reagent from a tank, at the same time diluting that which remains. Elaborate means for adjusting the orifices progressively as the reagents become more and more diluted are therefore required.

None of those methods is well adapted for feeding chemicals to a hot-process softener, which shou'd be designed for operation under a slight pressure, since it is necessary to carry a few pounds back pressure upon the exhaust steam, in order to insure a temperature of at least 205 deg. F. in the treated water at all times. With the methods just mentioned it is necessary either that the chemical-feeding equipment be inclosed within the steam space or else that the chemical and raw water, after being proportioned, be pumped into the softener against the back pressure.

If the water wheel or the tilting bucket is inclosed so that the reagents can flow by gravity directly to the reaction chamber, steam finds its way into the chemical tank, where it condenses, diluting the reagents and rendering the feed inaccurate. The divided-flow method involves an additional pumping of both the raw water and the reagent, and is therefore complicated and expensive.

In another arrangement the raw water is passed through a hydraulic motor, of either the reciprocating or the rotary type, and this drives a small chemical pump. This method is defective because it is practically impossible to prevent slippage past the valves and packings of such motors and pumps, which renders the proportioning inaccurate.

The chemical proportioner used in the Sorge-Cochrane hot-process softener to regulate the feed of chemicals in proportion to the flow of raw water is a true flow proportioner. The chemical to be fed to the softener is forced through an orifice by a pressure just equal

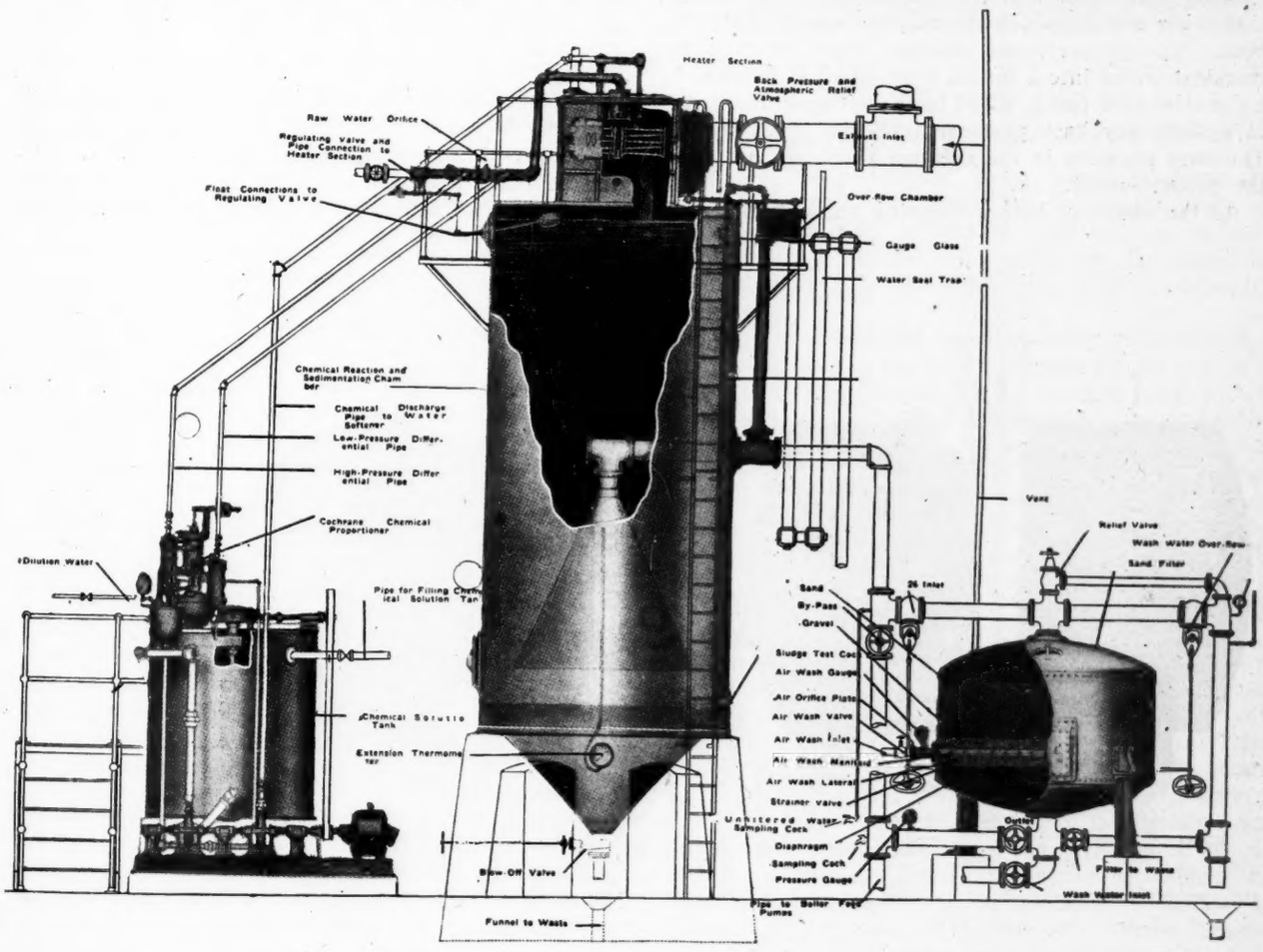


FIG. 3. SORGE-COCHRANE HOT-PROCESS WATER SOFTENER COMPLETE

This apparatus consists of a chemical-reagent tank, together with its pump and reagent proportioner, the softener proper and a sand filter.

to the differential pressure set up by the flow of the raw water through an orifice in the supply pipe.

To understand how the device works reference may be made to Fig. 2. Between two flanges in the pipe through which the raw water flows to the heater at the top of the softener is placed a thin orifice disk. From the two sides of this orifice small pipes lead to the opposite ends of a cylinder containing a piston. The piston is thus acted upon by the differential pressure set up by the flow of water through the orifice.

The vertical piston rod extends through water glands at each end of the cylinder. On the lower end of the rod is a valve disk, which closes over an opening through which a fluid mixture of the reagents is constantly being forced by a centrifugal circulating pump. The weight of the piston, rod and valve disk is counterbalanced.

The differential pressure acting upon the piston pushes the disk down upon and tends to close the opening, while a pressure builds up underneath just sufficient to balance the differential pressure. The pressure of the chemical solution is therefore directly controlled by the differential pressure resulting from the flow of water through the orifice in the raw-water pipe. Through a simple pipe connection, this pressure acts directly at the chemical orifice, insuring an effective pressure thereon at all times equal to the differential pressure on the raw-water orifice.

Most of the chemical solution supplied by the circulating pump flows out from under the disk, through a strainer and thence back into the chemical-solution tank. The proportioned chemical flows through the chemical orifice into a funnel from which it is taken by a chemical feed pump, lifted to the softener and forced in against any back pressure that may exist therein. The back pressure in the softener thus does not affect the proportioning.

As the chemical before escaping through the small orifice is not in contact with air, no incrustation occurs upon it, but to provide for dislodging any obstruction a cleaning needle is so arranged that it can at any time be forced through the orifice by the pressure of the hand.

Besides being accurate this arrangement has these additional advantages: Only one chemical-solution tank is required, which is at the ground level, where it can be charged without hoisting of chemicals or inspected without climbing a ladder.

The motor which drives the circulating pump also drives agitating paddles in the tank. Milk of lime can thus be kept in suspension and fed as well as purely fluid reagents. The large saturator tanks necessary where lime water is used are eliminated and the difficulty due to the fact that lime water varies in strength according to temperature is avoided.

Solutions of caustic soda or sodium carbonate, lime water, milk of lime or any mixtures are all handled equally well and fed accurately. The accuracy with which the solution is fed is well within 2 per cent, which is closer than attendants will measure out chemicals into the chemical tank. Representative test results are shown in the following table:

Rate of flow of raw water—gallons per hour	Rate of flow of chemical, gallons per hour	Chemical per gallon of water	Variation, percent
1740	134.6	0.0773	0.28
1590	122.2	0.0769	0.22
1410	108.4	0.0769	0.22
1160	88.8	0.0766	0.71
710	54.6	0.0769	0.22
411	31.8	0.0773	0.28
290	22.4	0.0773	0.28
290	22.5	0.0775	0.52
184	14.3	0.0771	0.03

The chemical treatment is controlled by drawing off a sample of the treated water from time to time and titrating with a standardized solution, the whole operation requiring about 10 min. By locating the titration readings thus obtained upon a chart the operator sees

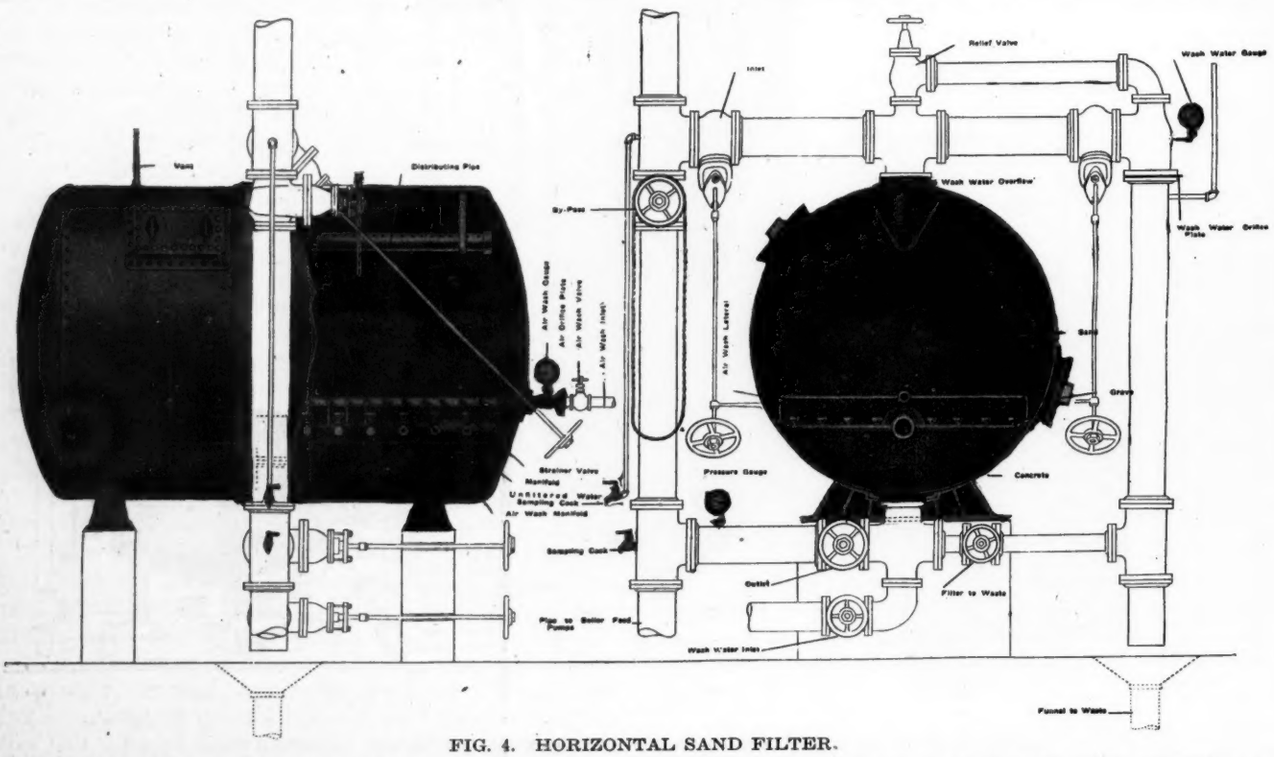


FIG. 4. HORIZONTAL SAND FILTER.

This filter is so arranged that the sand bed may be stirred up at suitable intervals by means of air or water under pressure. This permits effective operation over long periods without actual cleaning or renewal of the filtering materials.

at a glance what change, if any, is required in the amounts of the chemicals.

This apparatus, as may be seen, is quite simple and compact. The open heater, with an oil separator attached for purifying the exhaust steam which is used for heating the water, is mounted directly over the reaction and sedimentation chamber. The water is heated to steam temperature by spraying it over trays.

The precipitated matter deposits in the conical bottom of the sedimentation chamber. From there it can be quickly washed out by the opening of a single valve. In order to eliminate convection currents the hot water and the softening reagents are delivered at the top, and travel slowly to the bottom, whence the clarified water is drawn off by an inverted funnel. The precipitates formed when the water is first mixed with the chemical settle through the water below, thus securing a screening effect and a gathering together of the smaller particles.

The removal of scale-forming matter at high temperature by sedimentation is so effective that for many waters and plant conditions it is entirely practicable to dispense with filters. Many softeners are accordingly installed without such devices and are successfully protecting the boilers from scale and corrosion, even though the softened water contains a small amount of suspended matter.

Arc-Welded Bonds Eliminate Moisture and Defy Corrosion

Bonds Can Be Arc-Welded Without Disturbing Traffic and Equipment Is Available for Other Arc-Welding Such as Every Shop Demands

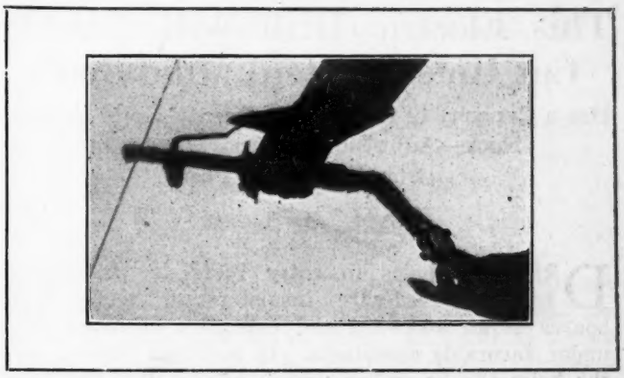
By W. P. Bovard,
Mansfield, Ohio

Several methods of mechanically joining metals, such as clamping and riveting, have been used since the inception of track bonding as a means of electrically and mechanically connecting copper bonds to track rails in order to insure an electrically continuous return path for the haulage current. From the mechanical standpoint the clamping of the channel pin and the riveting secured by the terminal compressor or the expansion pin appeared to be satisfactory. From the electrical standpoint, however, these methods have not always proved entirely desirable because of irregularities and carelessness in installation.

The channel-pin method of bonding never proved adequate electrically because of the impossibility of excluding moisture from the contact. The compressed and pin-expanded copper terminals show less tendency to deteriorate, but under the strong corrosive agencies encountered in mine service it is difficult to maintain a perfect contact between bond terminal and rail.

One of the many successful applications of electric arc welding of much service to industry has been in the construction of tanks and boilers. Welding of seams is rapidly superseding riveting because of the greater ability of the welded seam to withstand corrosion and pressure. It is just as obvious that the welded contact should supersede the mechanical in the track bonding of mines. The metallic electric arc has proved itself the most adaptable means to this end.

In mine service it is desirable that track bonds should



ARC-WELDING TERMINAL WITH ELECTRODE IN PLACE

The switch operates a remote control that cuts off the entire cable, thus rendering possible easy and safe adjustment of the electrode.

be of such design as to be able to withstand the severe conditions imposed by frequent derailments. The accompanying illustration shows a type of rail bond which has been widely used, being designed for application to the base of the rail. This bond is provided with steel terminals which are welded to the rail by the aid of a soft-steel electrode, thus insuring a permanent connection of low resistance. Being placed, as shown, low on the rail and underneath the joint bolts the bond receives maximum protection. Installation is made without removing the joint plates or disturbing the ties. Consequently the cost of the work is reduced to a minimum.

BOND WELDED IN POSITION

The copper cable spans the rail joint below the heads of the joint bolts. It is thus in a degree protected by them.

Owing to the limited space available underground, it is advantageous to use welding apparatus for the work, and this may be handled by the bonding crew without interference with traffic. A type of resistance welding apparatus which has met the bonding requirements of mine service satisfactorily has control features which insure ample welding current under the varying voltage and also furnishes the operatives with full protection from electrical shock. This latter feature is secured by means of a remote magnetic switch under control of the operative.

Corporation President's Powers.—The president of a business corporation has no power to bind the company by executing notes in its name without the consent of, or consultation with, the board of directors. The circumstance that the president may own nearly all the stock does not affect the case. A corporation is a distinct entity under the control of its directors, and the president may not exercise the authority of executing promissory notes thereof on his own motion or otherwise than as empowered in the articles or by-laws or by the managing directors of the company. *(Iowa Supreme Court, Goodman Manufacturing Co. vs. Mammoth Vein Coal Co., 168 Northwestern Reporter, 912.)*

This Electric Drill Will Quickly Cut Holes in Hard Mine Roofs

Has a Capacity of from Six to Twenty Holes in Hard Rock—Adjustable for Roof Heights of from Five to Six Feet

BY E. M. BACKIE
Syracuse, N. Y.

DRILLING holes in entry roofs for trolley-wire hangers, feed-wire insulators or trolley-guard boards is an awkward and expensive operation even under favorable conditions. In soft-rock top or slate the holes can be drilled with a hand auger, but when the top is composed of a hard-rock formation this work has to be done by other means, as the auger has its limitations.

A machine electrically operated and of light weight, designed and built a few years ago, does this work rapidly and cheaply. It was tested for several months in different mines and under severe conditions. The result of these tests was a reconstructed machine, which has been made in large numbers and is now operated in many mines throughout the coal fields with quite satisfactory results.

This machine is a simple mechanical device operated by an electric motor. It is easily handled and operated by one man or a man and helper, while its drilling capacity is large. In average hard-rock mine roof, 10 to 20 holes 1¼ in. in diameter, 5 in. in depth, have been drilled in one hour. In the hardest kind of rock six to ten holes have been drilled in the same time.

PORTABLE ELECTRIC DRILL FOR WORK IN THE ROOF
This drill and its mounting may be easily carried about the mine. Mounting may be made to suit the height of roof encountered.

The accompanying illustration shows the machine as it has been developed and is now used in many coal mines throughout the country. The outfit consists of the drill proper and its mounting. The weight of the drill is 55 lb. It is separable from the mounting to afford an easy carry. The mounting consists of a fork-shaped yoke and a feed screw which telescopes into a pipe support. This pipe can be made of any length, but the standard adopted is suitable for roof heights of from 5 to 6 ft.

The drill bit is made from a 1-in. round bar of rock-drill steel. One end is forged square ⅞ x ⅞ in. to fit the chuck. The other end is the regular six-point rock-drill bit, which is readily shaped by the mine blacksmith with the aid of a forming tool furnished by the maker as part of the equipment.

When the machine is in drilling position a canvas hood or jacket protects it from the dust which drops from the drill hole. The power consumption is only 600 watts, or less than one electrical horsepower. The Pneumelectric Machine Co., of Syracuse, N. Y., the builder of this tool, has placed it on the market under the name of "Plugger."

Portable Gasoline Air Compressor Suited to Scattered Work

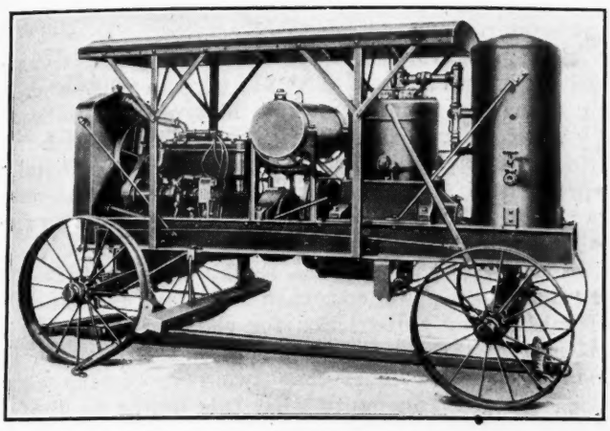
Driven by a Four-Cylinder, Four-Cycle Gasoline Engine—Cooling of Cylinders is Secured by Open-Hopper Jacket

WIDESPREAD application of compressed air to industrial purposes has increased the demand for a portable aid compressor—an independent, easily movable unit. Such a compressor has proved highly useful for the operation of drilling tools for rock or other minerals wherever the work is scattered and too small in quantity to warrant a fixed compressor and drill plant at any one point. Of course, such a portable unit can in many instances be used advantageously for riveting, in the construction of steel tipples, trestles or buildings, or for driving wood augers and other construction tools and appliances.

The portable outfit here illustrated, made by the Sullivan Machinery Co., of Chicago, is an entirely new development, based on the company's experience with similar outfits during the last eight or ten years. This rig includes a specially designed two-cylinder vertical air compressor, driven by a Buda four-cylinder four-cycle, heavy-duty tractor gasoline engine, through a gear and pinion.

The compressor and engine, together with a vertical air receiver, gasoline supply tanks, radiator and fan, are mounted on a truck body made up of heavy channel irons, strongly braced. The truck body is mounted on heavy steel wheels or, if desired, the entire rig can be set on a flat car or other more substantial mounting. The outfit is protected from the weather by a steel canopy top which is provided with canvas curtains.

The air compressor employed has a displacement of 150 cu.ft. of free air per minute, and requires 32 hp. for operation against 100 lb. pressure. The air is admitted and discharged from the cylinder by means of Sullivan improved wafer valves. These valves are placed radially with respect to the axis of the cylinder and close to its upper end. They are held in place by flat circular leaf springs. Both valves and springs



PORTABLE COMPRESSOR AND ITS TRUCK
Compressor, receiver, engine, fuel tank and radiator are all mounted on a truck that can be hauled readily from place to place.

are made of the finest tempered steel and the valves open against specially-designed guard plates intended to give a wide port opening with small clearance loss.

Cylinder cooling is secured by an open-hopper jacket into which water can be poured from a bucket or through a hose. This type of cylinder cooling has proved particularly effective on portable compressors for many years and does away with the complication of a circulating pump and piping.

Power economy is effected when air is not required by an unloading device and pilot valve connected with the air receiver. This raises the inlet valves from their seats when the demand for air temporarily ceases. Lubrication is secured by a force-feed oil pump inclosed in the crankcase and delivering oil under pressure to all bearings. Baffles and wiper rings prevent an excess of oil from working up past the piston and collecting on the valves and seats, with danger of carbonization.

The drive, as stated above, is by gear and pinion. A heavy-geared flywheel with cut internal teeth is mounted on the compressor shaft and engaged by a pinion on the engine shaft. A disk clutch placed on the shaft between the pinion and the engine is thrown out when starting until the engine is up to speed.

The engine adopted for driving this compressor is of an extremely rugged and reliable type. The cylinders are cast *en bloc* and provided with a removable head. The machine has three-point suspension and all mechanism is inclosed and adjustable. The camshaft is hardened and ground. The crankshaft is of special design, securing accurate running balance, and is supported by three babbitt-lined bronze bearings. The accessories, such as the magneto, impulse starter, carburetor, speed governor, starting switch, spark control and hand throttle, all combine simplicity with effectiveness and reliability. The gasoline supply tank will hold 23 gal., which is sufficient for a day's run.

Contributory Negligence of Injured Miner.—The provision of the mine safety laws of Iowa, requiring miners to examine their working places and to make the same safe before commencing work, extends to an employee engaged in reconstructing an entryway to a mine. An operator need not warn an employee of dangers that are as obvious to the latter as to him. (*Iowa Supreme Court, Holmes vs. Bloomfield Coal & Mining Co., 162 Northwestern Reporter, 820.*)

Roller-Bearing Wheels Ease the Way from Face to Tipple

Modern Car Wheels Effect Savings in Lubrication, Power, Time and Length of Service — Anti-friction Bearings Save 58 Per Cent of the Power

BY D. B. TURNER
Knoxville, Tenn.

MOST coal men are familiar with the old solid-hub wheel having a lynch pin that passed through the axle and held the wheel in place. In order to secure proper lubrication this wheel required oiling at frequent intervals. This device was soon supplanted by a type of wheel provided with a hollow hub forming an oil reservoir with passages leading to the journal. When properly fitted and equipped with felt washers this type of wheel would operate for several weeks with one charge of lubricant.

Numerous attempts were made to improve upon this general scheme and in 1908 the Sanford-Day Iron Works of Knoxville, Tenn., brought out what it now terms its old style Whitney roller-bearing wheel. This was familiarly known as the "R-B" and is shown in cross section in Fig. 1. The hub of the wheel was lined with a special grade of steel and the rollers operated between this lining and the axle.

A cage held the rollers in their correct position while a thrust washer, interposed between the pedestal box and the inner end of the wheel hub, served as a buffer and took up wear. Felt packing made the joints tight and permitted lubrication with oil. The wheel was held on the axle by locking rivets or bolts that passed through the pedestal box on either side of the axle and engaged in a groove in the wheel hub. The wheel was oiled through a hole at the end of the hub and a sizable oil reservoir was provided. A plug closed the oil hole.

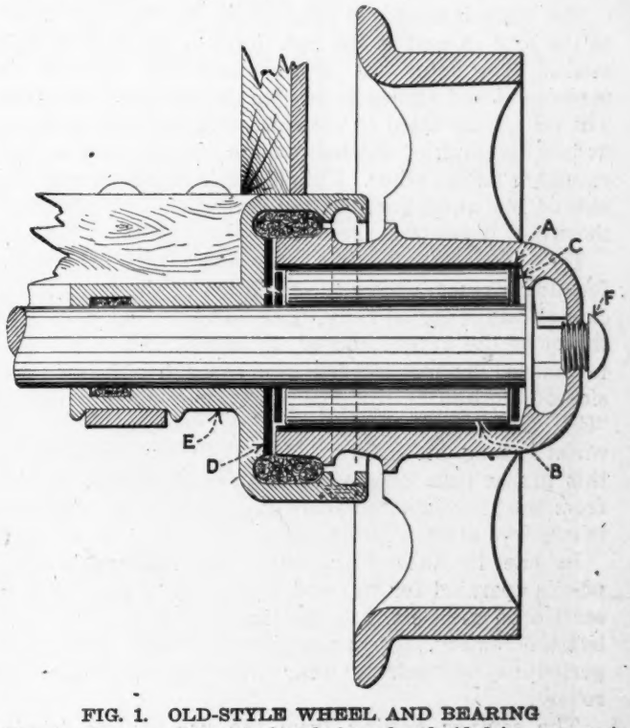


FIG. 1. OLD-STYLE WHEEL AND BEARING
This bearing was felt packed and showed a decided improvement in service over previous journals.

This wheel gave much satisfaction and it was found that it might be operated six months on one lubrication. Instances are known where these wheels were run on one oiling for two years or more without appreciable wear of any of the parts. They can be run under water without danger of sediment or grit finding its way into the bearing.

In the quest for further simplification, the Whitney Wonder roller bearing was placed upon the market in

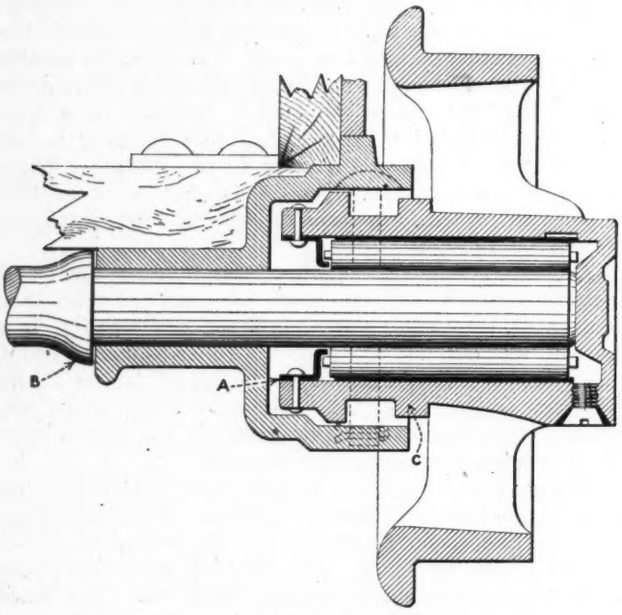


FIG. 2. NEW WHITNEY WONDER WHEEL
This journal retains the good features of its predecessors as well as certain later improvements.

1913. This wheel is shown in cross section in Fig. 2. As is evident upon inspection, this wheel is extremely simple and efficient.

The method employed for holding the old-style wheel to the axle as well as the hub lining is retained in this model. The outer end of the wheel hub, however, is made solid and arched to receive the thrust of the axle. The rollers are fitted on the ends with projections which fit into the arch of the hub on one end and into a steel stamping on the other. This latter is lightly riveted inside of the wheel hub, holding the rollers in place when the wheel is removed from the axle.

This steel stamping or cup washer acts as a dam, forming a reservoir for the retention of whatever lubricant is employed. A collar upon the axle transmits side thrust to the arched end of the wheel hub. Grease is introduced by means of a gun through a hole in the side of the hub until it starts to come out at the point "C." This signifies that the internal portion of the wheel is completely filled. If of the proper consistency this grease acts as a packing, preventing dirt or grit from working into the bearing. About 1 lb. of grease is required at each filling.

In one instance four trucks provided with these wheels operated for two and one-half years under hard service on grease which was in the wheels when they left the factory. Upon examination at the end of this period no appreciable wear was apparent upon the rollers.

The savings arising from the use of anti-friction bearings accrue from four different sources—lubrication, power, time and length of service. The cost of lubrication is an important item. This expense is variously estimated at from $6 to $15 per car year, according to the cost of lubricant and the type of plain-bearing wheel with which the wheel is compared. With the price of oil high this saving of course is proportionally large, while if a car greaser is employed this man may be cut off the payroll when the change is made to the roller-bearing equipment.

Actual tests have shown a saving of as much as 58 per cent on the power consumed in haulage as the result of substituting anti-friction for plain bearings. This means that three cars with improved bearings can be hauled with less effort than two plain-bearing cars. Each operator can figure what this means to him in dollars and cents. Of course, the saving effected in power consumption varies widely with conditions, but there is always a big margin in favor of the roller-bearing wheel.

Time Is Saved by Roller-Bearing Cars

The saving in time is almost a direct result of the saving in power. As the result of such power conservation a locomotive can move more cars per shift, while the ease with which these cars can be pushed to the face gives the miners more time to load coal or to perform other duties. For a given output this of course results in having fewer men on the payroll.

A roller-bearing wheel if properly designed and constructed should outlast, under normal conditions, at least two plain-bearing wheels. The plain-bearing wheel usually finds its way to the scrap heap because of a worn hub, when the tread might be good for many years of additional service. If the roller-bearing wheel is kept properly lubricated the tread determines the life of the wheel. Any damage occurring to the bearing may be repaired through replacement of damaged parts at a trifling expense.

With most operators seeing is believing. Most of them also are "from Missouri." Such operators may well secure a sample set of roller-bearing trucks and conduct their own experiments.

Limits of Switching Service.—The following language used by the Minnesota Supreme Court the other day in the case of *Commercial Club of Duluth vs. Northern Pacific Railway Co., 165 Northwestern Reporter, 270,* throws some light on the question as to how the line is to be drawn between switching service and actual transportation carrying a distance tariff, in the movement of shipments between a city and one of its suburbs: "The limits of a shipping point are not necessarily coincident with the limits of a city. They may be more extensive. Perhaps they may be less extensive, but usually not.

"The important question is whether the district is a single industrial center. This is usually a question of fact. * * * In determining that question, the extent of the district, the industrial relation of one part to another, the nature of the traffic are things to be considered. Whether the traffic is handled by train crews or switching crews, and whether on way bills or switching orders, are matters to be considered, but the manner of handling is not decisive. The fact that the railroad and the public have acquiesced in applying a switching tariff is important when that fact appears, as it does here."

Gasoline Mine Locomotive Operates with Efficiency Despite Heavy Grade

Provides Transportation on a 5-Per Cent Grade-Delivering Five to Eight Cars Per Trip, the Return Trip Being Roughly a Mile Long

By A. C. Paul
Milwaukee, Wis.

NOT only are gasoline locomotives rapidly replacing other forms of haulage for surface work but they are also meeting many of the problems of mine haulage, for, being self-contained units, none of the complications inhere to their installation that are found when introducing for the first time electrical, steam or compressed-air locomotives. Gasoline is not always the correct solution of haulage problems, and conditions sometimes present themselves where some other form of motive power would be more advantageous.

A good example of the efficiency of the gasoline locomotive may be found in the No. 2 coal mine of the Stewart Iron Co., Ltd., located at Coolspring, near Uniontown, Pa. This is a shaft mine tapping a field of 120 acres of 5-ft. Sewickley coal. While classed as one of the smaller operations, its production attained such proportions some time ago as to demand a more modern and economical method of haulage than that furnished by mules. Furthermore, a grade of nearly 5 per cent against the loads required the installation of a system of sufficient power to overcome such adverse conditions. On the other hand, the comparatively small acreage forced a careful scrutiny of the first cost as well as of the probable upkeep of the prospective transportation system.

Superintendent Thomas W. Keighley spent considerable time in detailed study of this haulage problem, as well as in careful analysis of the merits of the various systems available. He finally selected a type "L-30" 6-ton gasoline locomotive manufactured by the Milwaukee Locomotive Manufacturing Co. This was installed Dec. 15, 1918, and an inspection of the Stewart mine on April 8, 1920, found the motor doing more than had been expected of it and showing for sixteen months' service a highly satisfactory record for reliability and upkeep.

This locomotive is in constant service six days a week, and up to April 8 of the present year there had been no occasion for any delay. The daily tonnage is hauled in trips of from five to eight cars, weighing with load from twelve to nineteen tons. The length of one-way haul is 2,400 ft., and the grade on about 1,000 ft. of this distance is approximately 5 per cent.

In operation this locomotive has proved itself economical and represents a notable saving in time and money over the old haulage system. In addition to this there has been a marked improvement in working conditions, as the old delay in the placng of empties has been avoided and the loaded cars have been moved more promptly. This has resulted in a general speeding up of the mining operation and in bringing about a bigger tonnage as well as a shorter day.

When questioned regarding his opinion of the service rendered by the gasoline locomotive, Superintendent

GASOLINE LOCOMOTIVE AND ITS TRIP
Installation of this machine greatly facilitated operation, because of the increased reliability in car placements.

Keighley was enthusiastic. "I am thoroughly converted to the gasoline motor for mine haulage. Our machine was installed only after considerable debate and investigation, and was chosen largely on account of its economy. Its first cost was less than half that of an electric haulage system, and its maintenance has been extremely satisfactory. I thought when we bought it that it would do the work, and now after a year's test, and under operating conditions that are about as hard as can be found, I am an enthusiastic booster for this machine. We would not now consider its replacement with any other form of mechanical haulage. It represents the most simplified form of power. There are no trolley wires to string and watch, no rails to bond, and the motor itself is so free from mechanical adjustments that we consider it 'fool-proof.' Best of all is the effect on the men. They regard the locomotive as their best friend and if the substitution of another form of haulage were suggested, I know they would vote it down if they were permitted to express themselves."

Extended Air Lines Giving Way To Portable Compressors

Which "Make Air Where It Is Used"—A Drill That Can Be Suited to the Work Regardless of the Hardness of the Materials

By D. E. Dunn
New York, N. Y.

A PROGRESSIVE step in the coal-mining industry was the linking of the motor, compressor and percussive drill into practically one compact, portable unit. This was accomplished by the Ingersoll-Rand Co. when it perfected the portable mine-car compressor and the mounted or unmounted jackhamer that could be used with either hollow hexagon or twisted concave auger steel.

Previous to the introduction of this apparatus the work now performed by it was accomplished by means of cumbersome, specialized machinery. This was costly, slow in operation and not easily adapted to local conditions. It was deceptive, too, in that despite its sturdy appearance it was easily and frequently put out of working condition.

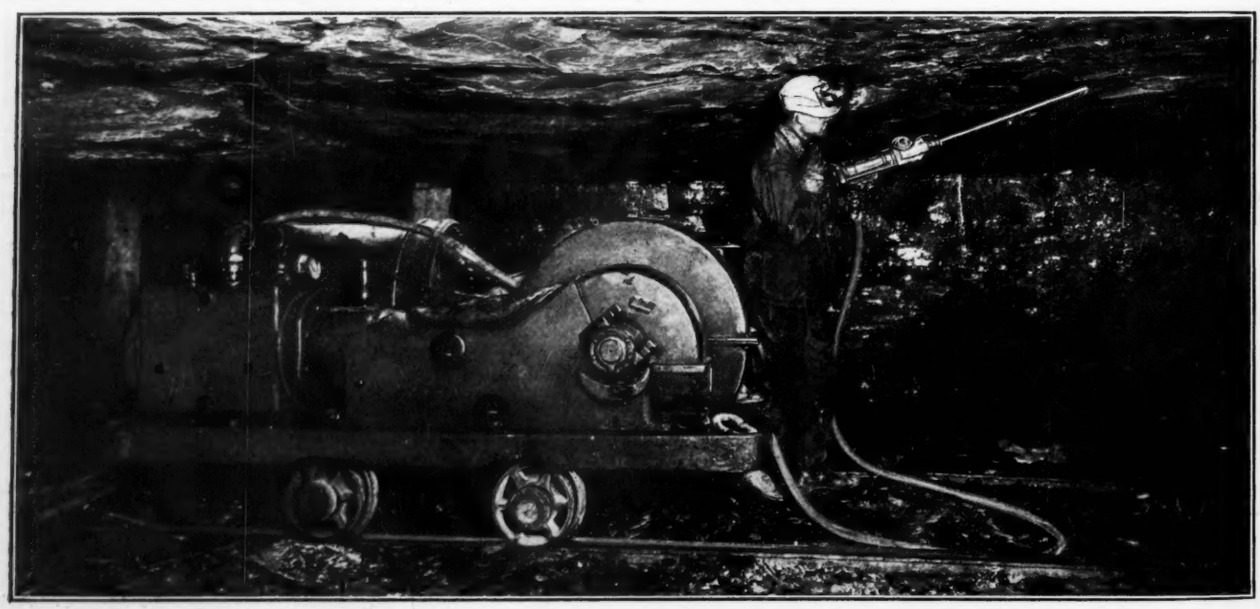
The term "specialized" employed above is used advisedly because the machine that did the entry cutting through hard rock was seldom adapted to the general work of mining coal. Hence another special machine had to be purchased.

To operate the old type of machines an elaborate surface plant and extensive underground pipe lines were needed. This meant large initial cost and high operating expense. Poorly-proportioned and leaky pipe lines alone have in a number of instances caused an outlay by operating companies of sums of money running into several figures. The additional expense of the greater numbers of skilled men employed on the old-fashioned machines need hardly be mentioned.

The mine-car compressor is a self-contained unit, consisting of a compressor with automatic unloading device, an air receiver with pressure gage, a safety valve, drain cock and service valve, electric motor with complete control, and herringbone gear drive. All this equipment is mounted on a cast-steel frame with steel wheels and axles. It is fully equipped and needs only to be connected to a source of electric power.

The jackhamer is built in five sizes, the one used most frequently in coal mining being a 35-lb. machine. In entry cutting through hard rock or in picking out rock bands a hollow hexagon steel is employed. For drilling coal concave auger steel has been found more satisfactory.

The combination of these two machines forms what might be termed a universal coal-mining unit. Were it not that one man is required to run it, it might be called an automatic unit. However, one man can and does operate the outfit. The saving it has effected both in initial cost and expense of upkeep as well as the advantage secured through "making the air where it is used" has been greatly appreciated by progressive coal-mining men.



MINE-CAR COMPRESSOR AND JACKHAMER IN OPERATION

This compressor is highly portable. It may be taken anywhere in the mine, connected to the current supply and put to work. Pipe-line losses are thus avoided.

Toronto Is Briquetting River Anthracite

Great Care Is Taken to Thoroughly Mix Coal and Binder; a Mixer, Malaxeur and Masticator in Turn Working to Secure Complete Intercompounding of the Materials—Water Cooling Prevents Adherence of New-Made Product

BY A. L. STILLMAN
New York City

PROFOUNDLY concerned over the recent and long-continued shortage in domestic sizes of anthracite fuel, official and financial Canada, as well as "the man in the street" have been seeking some substitute for hard coal. Being "the most distant market, and the last applicant at the source of the fuel . . . Canada can only ask for consideration. She has no voice in any proposals for developing or conserving production for her future necessities; no control over efforts to expand this industry; no means to compel any change in policy, and no authority to enforce her needs."*

The Canadian government is actively investigating the fuel resources of Canada, is vigorously planning the utilization of the Eastern and Western coal fields, and through the Lignite Utilization Board, is contriving how she may commercially, from the great lignite fields of Saskatchewan, obtain byproducts and then make briquettes of the residual carbon. The Canadian Pacific R.R. has for the last few years maintained a commercial briquetting plant at Bankhead, in Alberta, working on Canadian hard coal, but it remained for the enterprise of a private citizen, H. F. Slater, of Toronto, to provide a means for obtaining a coal supply for populous Ontario.

Early in 1919 Mr. Slater conceived the idea of producing better fuel for less money. Hardly less important was the companion idea of securing the co-operation of the people in financing his manufacture and selling his output. The Nukol Fuel Co., then organized, began an active campaign to secure that co-operation. To bring the proposal before the people the methods of the popular War Loan were adopted. It was realized that a new product appearing on the market needed a host of friends and "boosters." Many shareholders meant many users. Fuel production, to an extent at least, was to be placed in the hands of fuel users—a working out of modern ideas in industrial co-operation.

The product — yet to be made — was christened "Nukol." A survey of the fields of artificial fuel revealed the fact that the boulet plant of the Lehigh Coal & Navigation Co. was at that time being enlarged

FIG. 1. TANKS IN WHICH THE OIL BINDER FOR THE BRIQUETTES IS STORED

A good grade of binder, which will not run in warm weather, is used. Each tank holds 20,000 gal. A 2-in. steam coil carries live steam which keeps the oil from hardening into a solid. The pump which fills the tanks from tank cars also delivers the oil to the device where it is mixed with the coal.

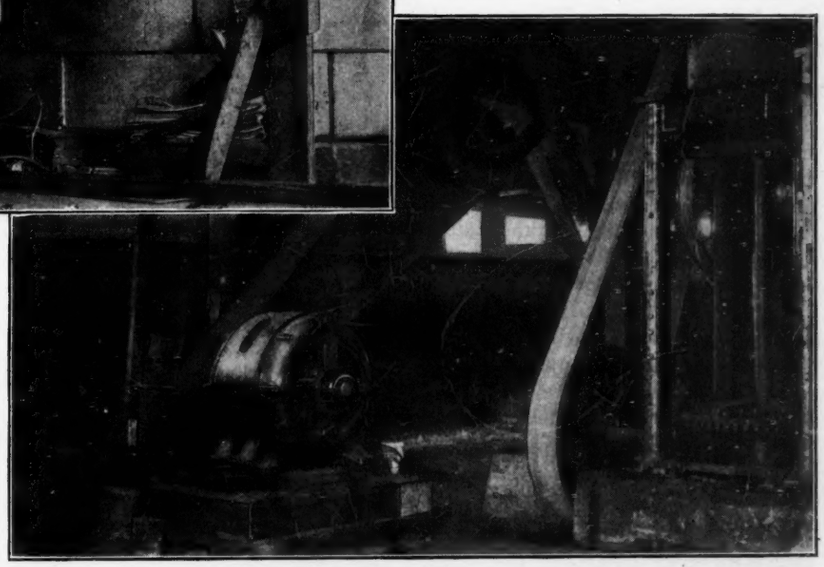


FIG. 2. DRIER INSTALLATION. ONE OF THE ROTARY SINGLE-SHELL DRIERS CAN BE SEEN IN REAR

Driers are 4 ft. in diameter and 45 ft. long and revolve ten times every minute, the terminal temperature being about 250 deg. F. A blower forces gases through the drier in the opposite direction to that taken by the wet coal, so that heating is progressively increased. Two per cent of moisture is allowed to remain.

*The *Canadian Mining Journal*, April, 2, 1920.

from 200 to 1,000 tons per day capacity after two successful years. There was no time or opportunity to experiment. The Nukol company needed a proven process to start immediate advertising with a reasonable guarantee of a successful issue. No time was lost in acquiring a license to work under the Dutch process of fuel briquetting (the process used by the Lehigh Coal & Navigation Co.). The General Briquetting Co. of New York was engaged to design a briquetting plant, and put it into successful operation. The work was assigned to J. B. McGraw, fuel briquetting engineer of that company.

Pending the successful outcome of experiments in byproduct production from the various fuel sources of Canada (which in time will presumably yield quantities of residual carbon ideal for briquetting purposes) the Nukol company obtained contracts and options on large supplies of Pennsylvania river coal, a low ash product and one excellent for the purpose. Shipments were begun immediately to the company's site at Toronto, and continued throughout the summer of 1919. The analysis of the river coal secured was as follows: Moisture, 2.18; fixed carbon, 76.30; volatile, 6.76; ash, 14.76; B.t.u., 12.329.

An advertising campaign unique to the fuel industry in its scope and character was inaugurated. Full-page advertisements in the newspapers began it. A house organ, "Nukol Nuggets," followed periodically, and incidentally was distributed by aeroplanes to the crowds assembled at the county fairs in Ontario. The trade character "Nukol Ned," a blackamoor of amusing characteristics, became a familiar figure in advertising cartoons. A song, "Nukol Sparks," was widely distributed. In short the advertising methods of the patent food product were successfully applied for the first time to artificial fuel. The appeal "Nukol is made in Canada, by Canadian labor and Canadian dollars," proved successful. Popular subscription financed the construction and ere long the multitude of shareholders were clamoring for their fuel allotment.

The selection of a site involved careful thought and the inspection of a great many offerings. Accessibility to transportation facilities and fairly large storage capacity for raw material were of prime importance. It was contemplated that a large part of the winter supply of raw fine fuel would be delivered to the plant by water during the summer months. Upon the close of navigation the heavy season for the briquetting industry begins, and certainty of rail communication was vital. The plant of the Toronto Shipbuilding Co., Ltd.—Cherry and Villier Streets—finally was purchased, fulfilling most completely all desirable requirements. This plant has a private wharf. Upon the ground adjacent thereto there is available open storage for between 20,000 and 30,000 tons of coal fines. Distant about 80 ft. from the water is a railroad siding, and just beyond that the mill building, 85 x 65 ft. Another railroad siding runs between this building and Villier St. The property has, in addition, smaller buildings adaptable to offices, machine shop and power plant.

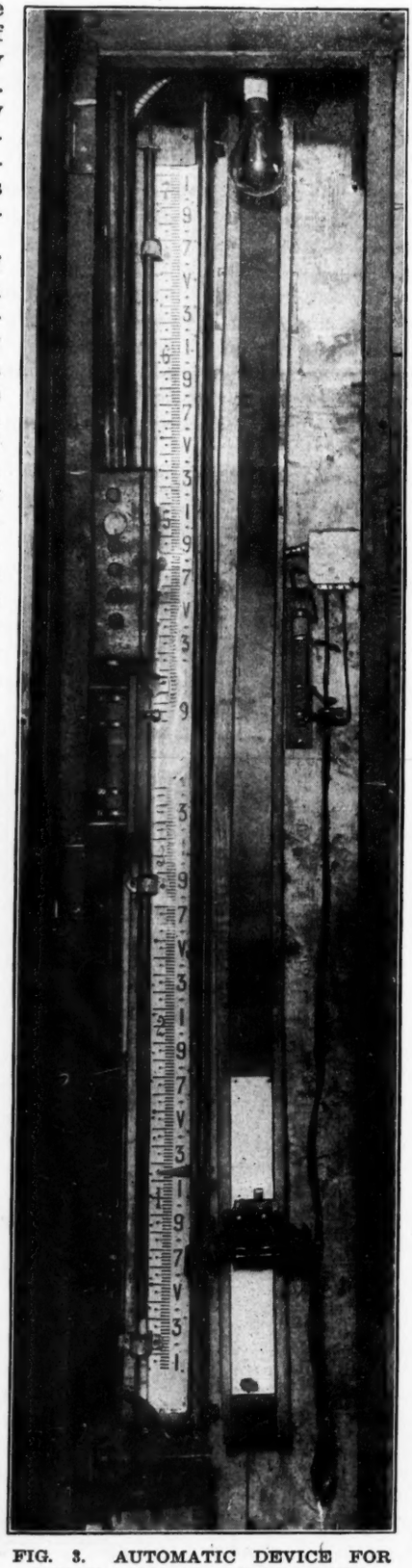


FIG. 3. AUTOMATIC DEVICE FOR REGULATING OIL-BINDER FEED

This apparatus also records automatically the operation of the press

It was expected that the machinery would be installed and the plant would be ready for operation on Sept. 1, 1919. It is needless to detail the various troubles experienced in obtaining shipments of machinery and parts during that summer. The plant was finally ready in December. It had a capacity of 15 tons 7-oz. size egg-shaped briquettes per hour.

The process of manufacture may be divided under the following headings: Drying and screening raw material, handling of binder, mixing of the coal and the binder, mastication of the mixture, pressing, final screenings, cooling.

The coal is quite wet, containing sometimes as high as 17 per cent moisture. That is the amount that coal of this size will hold hygroscopically. The culm may be taken directly from cars or boats as received, or from the stockpile. It is handled by a locomotive crane and dumped into a hopper, from which it is carried in a bucket elevator to a large bin, and from that conveyed to the apparatus for moisture removal (Fig. 2). The removal is accomplished by two rotary single-shell type driers, 4 ft. in diameter and 45 ft. long, operating at 10 r.p.m. (Fig. 3). The temperature at the end of the drum is about 250 deg. F.

An extremely fine size of coal is burned in the drier furnace and the gases are forced through the shell by the action of the blower, the speed of which can be varied in accordance with the varying moisture in the coal. The wet coal enters at the cool end, and is dried by coming in contact with gases at increasing temperatures while passing through the shell. With the process used it is not essential to dry the coal absolutely, and 2 per cent of moisture is allowed to remain.

Economically speaking, this is a great advantage, as the final 2 per

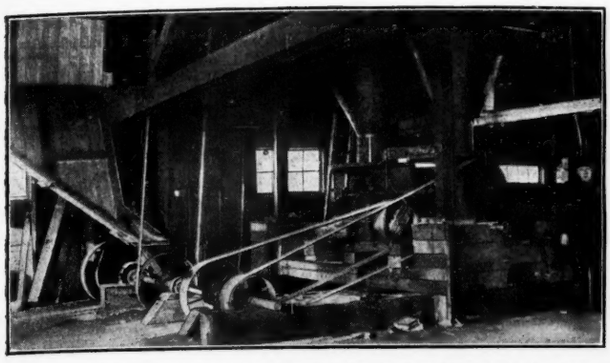


FIG. 4. FEEDING BINS AND PROPORTIONING TABLES

Here the coal is sent in measured flow to the paddle mixer. Between the bins can be seen the binder feed line delivering the requisite oil to the paddle mixer.

cent of moisture is by far the most difficult to remove, and its retention obviates any risk of overheating in the drying operation. The arrangement whereby the gases at their highest heat come into contact with the coal nearest to dryness and successively meet wetter coal as it proceeds through the drier tubes, insures a maximum efficiency of operation, the gases being discharged to the atmosphere in a saturated condition.

From the drier the coal is carried on a 12-in. steel-encased bucket elevator to a trommel screen, which removes all oversize (¼ in. and over). Practically all foreign material in the dust is over the size passed by this screen, so the screening at this point may be considered a cleansing operation.

The final coal, dried and screened, is carried to the feeder bins (Fig. 4), so called because from them are fed the tables whereon the proper quantity of coal is measured for mixing. These are storage bins built of steel plate and designed to hold ten tons each. It is desirable that these bins be kept full to secure a proper flow through the measuring device at their base, where there is an adjustable gate set at the will of the operator to provide a given quantity of coal per hour. The coal is fed from each bin to a revolving table, thence to the horizontal mixer, where it meets the oil binder. The oil binder is delivered to the plant by tank cars which are equipped with steam coils for melting down the contents, which are solid at ordinary temperatures.

The oil is an asphaltic residuum, commonly known as oil pitch, manufactured by the Imperial Oil Co. at its Montreal refinery. The tank cars delivering the oil each contain about thirty tons. A belt-driven 2-hp. Kinney pump is installed on the oil line in such a way that it can be used to pump the oil from the cars to the oil tanks, and from the tanks to the mixing device, where it is fluxed with the coal.

The capacity of each of the oil tanks is 20,000 gal. (Fig. 1). At the base of the tanks a 2-in. steam coil is installed, carrying live steam to keep the oil in the tank liquid. The filling of the tanks from the cars is done on overtime, when the plant is not running. Before entering the pump the oil is carefully strained through a steam-jacketed strainer. Over the mixing device is placed a small horizontal feed tank, fed from the large tanks by the same Kinney pump as is used to unload the cars. This tank is kept full, and the overflow sent back to the storage tanks by a return pipe.

This circulation contributes to the continued homogeneity of the oil. With each oil pipe is carried a ¾-in. steam pipe, the two being wrapped together in a magnesia insulation material to prevent the oil from solidifying in the pipes. From the small feeder tank the pipe line runs to the mixing device, where it is delivered at about the same point as the coal. The melted oil is delivered in a fine stream, the rate of flow under present practice being adjustable by a valve. The operator sets this valve and adjusts the gate over the tables admitting the coal in such a way as to give a mixture of 95 per cent coal and 5 per cent oil.

An automatic adjustment for the binder feed is in course of installation (Fig. 3). A pointer is set on a scale adjusted to run by clockwork parallel to the decreasing surface of the oil in the binder tank. The speed of the descending pointer is set at the rate at which the proper binder proportion is to be fed. A salt-water column is placed parallel to the pointer showing the actual level of the binder in the tank.

J. B. McGRAW
Designer of the Toronto plant

As long as the salt-water column and the pointer descend at equal speeds and maintain their relation unchanged it is known that the proper binder percentage is being carried to the mixer. If the oil is fed too rapidly or if the pipe is clogged a disparity between the two rates of speed occurs immediately. An electro-magnet is set so as to close a circuit the instant this condition occurs, and an alarm is automatically rung, so that a correction can be made immediately.

This is of extreme importance, for a variation in the binder percentage either way is fatal to the quality of the final product. Too much binder, aside from being wasteful, gives a soggy and smoky briquette; too little binder gives briquettes incapable of shipment without disintegration. In addition to the regulation of binder feed this apparatus carries a traveling-time sheet, which records automatcally the hours of press operation.

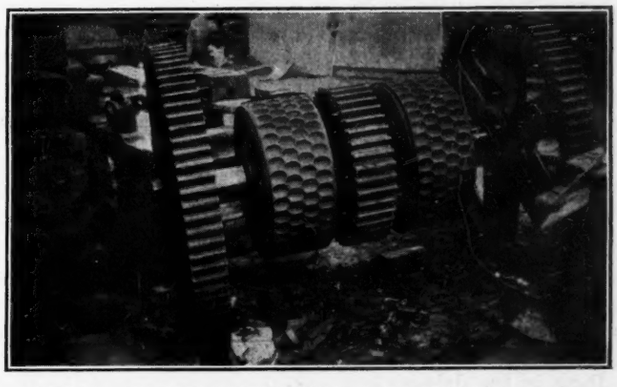


FIG 5. ONE OF THE ROLLERS OF THE EGGETTE

Note the egg-like depressions in the rollers by which the briquettes are formed.

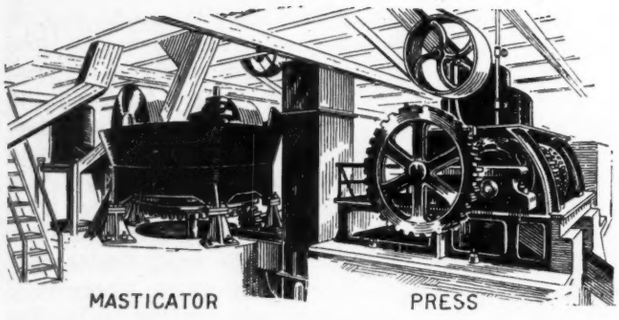


FIG. 6. MASTICATOR AND EGGETTE PRESS

The masticator weighs 47½ tons and its operation requires 55 hp. It receives its feed from the malaxeur. The movement of the rolls completely incorporates the coal with the binder. In the press this mix is subjected to a pressure of from 1½ tons to 2 tons per sq.in.—a pressure equalling 200 or 250 atmospheres. No wonder adherence is secured.

The dried culm and the binder properly proportioned meet at the head of a 15-ft. paddle mixer (Fig. 4). The function of this machine is the thorough mechanical mixing of the two ingredients. Seventeen sets of paddles revolving in a horizontal trough force the mixture forward, at the same time imparting a thorough agitating and mixing effect. The viscosity is preserved and improved by the injection of a supply of live steam throughout the operation.

To complete the mechanical mixing the coal-oil mixture which, for the sake of convenience, may be designated a flux, is delivered into a vertical, cylindrical malaxeur. Again steam is injected into the mass, which is kept in constant agitation by a revolving shaft carrying radial arms. Now the flux is ready for mastication.

In the briquetting of fine coals or other comminuted material, the most important factor in the entire operation is proper intercompounding of the binder. The developed theory has been that a coating of the minute particles with a thin film of the binding substance was sufficient, and various types of mixing machines—usually having some arrangement of moving arms—have been brought out to perform the work. This method, however, has never been entirely satisfactory, because it requires an excessive percentage of binder.

The originators of the Dutch process devised a machine to overcome these difficulties. This machine is known as a masticator (Fig. 7). It is not only a most efficient mixing device but is really something more, because by its action it causes a remarkable intercompounding of the coal and binder. The masticator at the Nukol plant is a ponderous machine consisting of a stationary bed 10 ft. in diameter, upon which two heavy rolls rotate at 18 r.p.m.

The base or bed is cast in one piece and is liberally reinforced by substantial ribs on the under side. It is set upon six pedestals bolted to the concrete foundation. Renewable wearing plates of cast hard white iron are provided and held in place with bolts that are easily accessible. A step bearing supported by radial ribs is cast in the center of the bed. It is lined with high-grade babbitt and carries the upright shaft. The driving gear is located beneath the working bed.

The vertical shaft is a hammered steel forging of ample diameter accurately turned and finished. The cranks and roll shafts are forged in one piece. The ends are threaded and provided with heavy nuts which secure them in the driving hub and also serve to hold the rolls in place against the centrifugal force generated by their rotation. The horizontal drive shaft and countershaft are cold-rolled steel. The driving head to which the cranks are connected is cast in three pieces to facilitate assembling. These pieces are securely held together by four steel bolts.

The rolls are of 60 in. diameter and 36 in. wide. The weight of each roll is 22,000 lb. The body or core of the rolls is of ordinary gray cast iron. The rims or tires are a special mixture hard white iron of great wear-resisting quality. The roll bearings are cast-iron bushings lined with high-grade babbitt. They are held in place with bolts and can be readily withdrawn for rebabbitting when necessary. Lubrication is provided by grease or oil forced through a channel cut longitudinally through the center of the shaft.

The masticator is compound-geared. The crown gear and bevel pinion are cast iron with molded teeth of heavy pitch and designed to transmit safely the required horsepower. The intermediate gears are cast steel with cut teeth. The machine weighs 95,000 lb. and its operation requires 55 hp. The flux is fed into it continuously from the malaxeur, and is thoroughly kneaded and masticated by the revolvng action of the rolls. Adjustable plows or scrapers carried on a supporting arm follow each roll, continuously stirring up the material so that the mastication is complete. At the same time the material is gradually forced to the center of the bed, where it is automatically discharged into an elevator, which delivers it to the feed box of the press.

This treatment causes an intimate intercompounding of the coal and binder to such an extent that, speaking practically, a homogeneous compound is created. The binder no longer exists as a mere glue on the surface of the minute particles, but by partial absorption has been incorporated into the material that forms the briquette, which in consequence, for hardness and strength is equal to the original lump coal.

The highest possible binding efficiency is thus obtained, with a saving of 2 or 3 per cent in binder, with a corresponding reduction in manufacturing cost. The extent of intercompounding in the briquette is proportionate to the viscosity of the binder and the length of time the mixture is subject to mastication. In all cases the masticator is adjusted so that the flow of material through it is continuous. It is essential that pressing follow mastication without delay.

From the masticator the flux is elevated directly to the feed box of the press. The feed box consists of a vertical cylinder with openings in the bottom over which feeding arms rotate. These arms deliver the flux

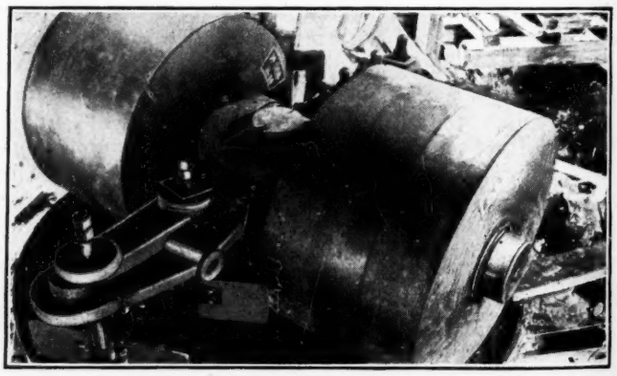


FIG. 7. ANOTHER VIEW OF MASTICATOR

The rolls rotate 18 times a minute and traverse a bed 10 ft. in diameter, the bed being cast in one piece and liberally reinforced on the underside with substantial ribs.

to the press in proper quantity and incidentally break up any caking developed in any of the masticated material.

The press (Fig. 5) proper is of the Belgian roll-eggette type. The rolls are duplex, with the driving-gear wheel between them. The diameter is 33¼ in.; the width of each roll 14¼ in. Each roll contains four rows of molds, staggered to afford the minimum of wasted space (which also means wasted power). The pressure at which the briquette is made is between 3,000 and 4,000 lb. per square inch. The pressing operation is, speaking generally, entirely in line with former briquetting practice, the changes and improvements being minor in importance.

For the highest efficiency in the pressing operation the rolls are set an appreciable distance apart. The flux falling between the molds cannot form part of the "egg," which is the real briquette, but becomes a "fin" at the sides, which from the standpoint of appearance at least is objectionable. Accordingly, the briquettes, coming from the press in a bucket elevator, are delivered to a revolving screen. The tumbling of the briquettes in the screen removes all "fins." The waste thus formed is delivered back to the masticator.

The briquettes as they come from the press are hard but still warm. Under ordinary circumstances passing over a cooling belt 30 ft. long at the rate of 30 ft. per minute is sufficient to provide ample cooling. The briquettes set and are hard enough for the usual subsequent handling. For extraordinary circumstances (such as exist in extremely hot weather) provision has been made to pass the briquettes through a water-cooling system. This system consists essentially of a water tank divided by a partition into down-flow and up-take compartments.

The briquettes drop into the down-take, sinking through the water, their path being lengthened by a series of inclined baffle plates. The base of this compartment is, in effect, a small bin with floor inclined at 45 deg. so that briquettes can feed by gravity through a gate to an elevator operating slowly in the up-take. The up-take elevator delivers to a storage bin. When this system is used the briquettes are cooled so thoroughly that by no possibility can they "run together" in the bins, as will uncooled briquettes through the softening of the binder caused by excessive interior heat.

So far the briquettes at the Toronto plant have been made in the 7-oz. size only, a size that parallels common egg coal. It has been planned to install a second press that will give the more familiar 2-oz. size, the equivalent of stove and nut. However, the 7-oz. briquette has, in the domestic market, proven entirely satisfactory in replacing all three sizes, and the proposed addition may prove unnecessary.

The cost of manufacture is well below the acceptable market price of the briquettes (between $11 and $12 per ton delivered). To provide an excellent binder of low penetrability, high melting point and one that will make a minimum of smoke involves a large expenditure of money, but the manufacturer actuated by a desire for more than mere cheapness feels well repaid for the size of this item of cost. The product has proven adaptable to practically all classes of domestic consumption, furnaces, cooking ranges, heaters and stoves. A portion of the factory is devoted to bagging, and a large bag trade has been built up.

Welded Bond That Resists Violence

Can, However, Be So Welded That It Can Readily Be Removed by a Chisel and Used Elsewhere

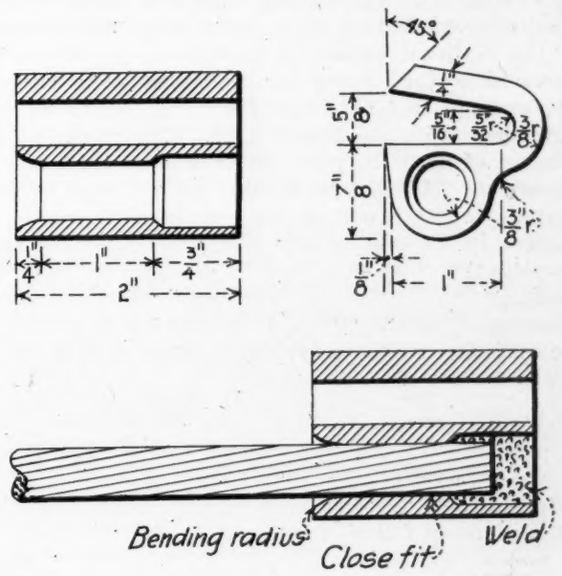
THOSE who pay for the loss of power, the repairs to equipment and sustain the other losses caused by inefficient track bonding, as well as those whose duty it is to install and keep rail bonds in repair, will be interested in the "Everlast" bond recently perfected and placed on the market by the Flood City Manufacturing Co., of Johnstown, Pa. This bond embodies certain details that tend to give it exceptionally long life.

Ever since the introduction of a practical arc-welding outfit embodying a portable bank of resistance it has become practical to weld bonds to mine track. This now can be done easily without in any way interfering with the operation of the haulage equipment. By welding, the metal of rail and terminal blend together and at the contact amalgamate as one. If the welding is properly done, therefore, there is no possible chance for the joint to become loose or for corrosion to occur between the surfaces in contact.

This advantage is common to all welded terminal bonds. It remained, however, for some one to perfect a means, without sacrificing other advantages, whereby bonds might be protected from injury after their installation. This, it is claimed, has been accomplished in the new bond, while certain features have been incorporated that make it easy to weld to the rail.

The bond is made up of a flexible cable with terminals welded to either end. These terminals are so designed that they can be driven tightly onto the edge of the base of any size of rail. The terminals may then be welded to the rail without the use of a holder of any kind. The welding is performed upon the top of the rail base, this being the point where this operation may be most easily performed.

Since the terminals are of generous proportions and the weld to the rail is well removed from the weld of terminal and cable there is no danger of loosening the cable weld in making the rail weld, no matter how inexperienced may be the operator of the arc-welding



TERMINAL FITS OVER FLANGE OF RAIL
It is easily put on, readily welded and of rugged construction.

machine. It will thus be seen that the copper cable is under the base of the rail and consequently well protected. The exposed portion of the terminal is in a measure protected by both the ball of the rail and the fishplate.

In installing this bond where a tie is placed under the rail joint this tie is moved slightly endwise until a notch to receive the bond cable may be cut in its top. The cable is then placed in this notch and the tie slipped back into place. The terminals are then driven onto the base of the rail and welded. This greatly increases the safety of the bond as the cable is held close under the base of the rail throughout its entire length.

In manufacture the terminals are first drilled to a snug fit on the cable. The corner at one end of the hole is then rounded off, the other end is counterbored for about half the length of the terminal and the cable is inserted and welded into place. This makes a strong permanent connection between cable and terminal.

After the terminal is welded to the base of the rail little short of a sledge and chisel will ever remove it. The conductivity, therefore, always remains high and there is no reason why the bonds should not last as long as the rails they join.

Where track is of a temporary nature the terminals may be lightly welded along the long side only. This makes a good contact that will last indefinitely but which may be removed by cutting off the edge of the terminal just back of the weld. The bonds may thus be installed again and again. In this way the bond may be used repeatedly.

The makers believe that, considering the durability of this bond, the trade name—Everlast—under which they have chosen to introduce and market it is both descriptive and appropriate.

Fuel, Heat and Light Advance Least Among Living Costs

National Industrial Conference Board Shows That Cost of Living Has Increased 95 Per Cent Since July, 1914

EXPENDITURES for fuel, heat and light form an interesting feature of a preliminary announcement by the National Industrial Conference Board on the increased cost of living for American wage earners. The average cost of living rose 7 per cent between November, 1919, and March, 1920. This marks a total increase of about 95 per cent since July, 1914, and an increase of 21 per cent within the last year. These figures are the result of the board's sixth survey of changes in the cost of living in the United States, a complete report of which will be available within a few weeks.

Increases between July, 1914, and March, 1920, in the cost of each of the five major items making up the family budget were as follows:

All items	94.8%
Food	100%
Shelter	49%
Clothing	177%
Fuel, heat and light	49%

Increases in the last four months, since November, 1919, were as follows:

Sundries	83%
Clothing	17.9%
Fuel, heat and light	7%
Sundries	4.6%

A number of reliable investigations, including some by the United States Bureau of Labor Statistics, have shown that before the war annual expenditures were apportioned approximately as follows: for food, 43 per cent of the total; for shelter, 18 per cent; for clothing, 13 per cent; for fuel, heat and light, 5 per cent; and for sundries, 20 per cent. These weights were used by the board in estimating increases in the cost of living since 1914.

While families differ somewhat as to the proportion of their incomes spent for the several items in the budget, any reasonable distribution of the income based on pre-war standards would show practically the same percentage of increase for the budget as a whole as that here given. Conditions in any specific locality, however, may in some instances be slightly unrepresentative, as, for example, in communities where very large or very small rent increases have occurred. Local rates for coal and light, street car fares, and the cost of other sundries items differ also, but in combining them in the total budget such discrepancies tend to disappear unless they are very unusual.

The combined cost of fuel, heat and light advanced less than one per cent between November, 1919, and March, 1920, although the total average cost was 49 per cent higher than in July, 1914, and 5 per cent higher than in March, 1919.

Coal prices were secured from 121 dealers in forty-four cities representing all sections of the country. The largest increases for anthracite were in the cities of the East, where advances in the neighborhood of 60 per cent since November, 1919, were reported from Providence, Bridgeport and Boston. Baltimore, Buffalo and Pittsburgh, on the other hand, had not raised prices.

In the Middle West the average increase for anthracite was less than one per cent, due to the fact that there had been no advance whatever in Cincinnati, Detroit, Duluth, Indianapolis, Louisville, Milwaukee, Minneapolis, Omaha, St. Louis or St. Paul. In Louisville, Columbus and Cleveland, as well as in Memphis, Little Rock and Seattle, the price of bituminous coal had fallen since November, 1919.

Less complete information regarding rates for gas and electricity indicated that the advance for these items since November, 1919, had been very small.

A summary of changes in the cost of living as estimated in the six studies thus far made by the board is given below:

INCREASE IN THE COST OF LIVING FOR WAGE-EARNERS IN AVERAGE AMERICAN COMMUNITIES BETWEEN JULY, 1914, AND MARCH, 1920, BY SEPARATE BUDGET ITEMS

(National Industrial Conference Board)

Budget item	July, 1914, to June, 1918	July, 1914, to Nov., 1918	July, 1914, to March, 1919	July, 1914, to July, 1919	July, 1914, to Nov., 1919	July, 1914, to March, 1920
All items	52.2%	65.0%	60.5%	72.2%	82.2%	94.8%
Food	62%	83%	75%	90%	92%	100%
Shelter	15%	20%	22%	28%	38%	49%
Clothing	77%	93%	81%	100%	135%	177%
Fuel, heat and light	35%	40%	42%	42%	48%	49%
Sundries	50%	55%	55%	63%	75%	83%

To Demonstrate Advantages of Hauling By Motor

FOR the purpose of demonstrating to the people of Massachusetts the possibilities of motor trucks for the movement of all sorts of commodities through various stages from producer to consumer, Ship-by-Truck Week is to be observed in that state from May 17 to 22.

Successive Stages in the Development of the Storage-Battery Locomotive

Several Steps in the Improvement of the Accumulator Locomotive Have Been Made in the Last Few Years—They Probably Foreshadow Still Further Developments in the Immediate Future

By J. Appleton
Ironton, Ohio

DEVELOPMENT of the storage-battery locomotive during the last five years has been rapid and marked by enduring improvement. This applies not only to the locomotives themselves, which have been bettered in design and broadened in facilities for operation, but also to the methods of applying them to the gathering and hauling of coal in the mines. Consequently operators have come to look upon these machines in a different light from that which they formerly entertained and have enough confidence in them to consider their employment well worth investigation when any extension or development is contemplated. The early mistake of applying these locomotives to uses for which they were not suited has been corrected, and valuable lessons have been learned from this experience.

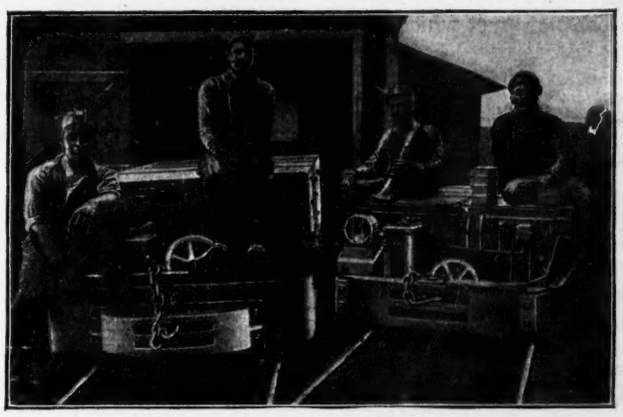


FIG. 1. TWO EARLY STORAGE-BATTERY LOCOMOTIVES
After nearly five years of operation these machines are still giving good daily service.

Those who desire to keep up to date concerning modern practice in gathering and hauling coal should find much to interest them in a brief story of this development as shown by the experience of one of the several manufacturers in this line. From this can be obtained a good idea of the present and future status of the storage-battery locomotive in coal-mine service.

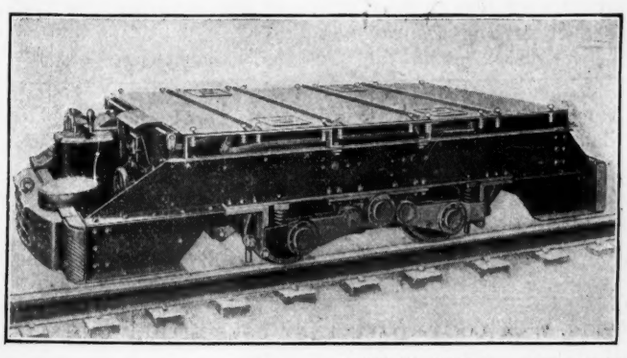
The storage-battery locomotive carries its own supply of power into the rooms and entries where no other source of energy is available. As the amount of energy that can thus be carried around is necessarily limited by the weight and chiefly by the space available, that is by the over-all dimensions of the vehicle, this machine must be so designed as to obtain the maximum results from this limited supply of power. Hence combined efficiency, mechanical and electrical, is of the utmost importance.

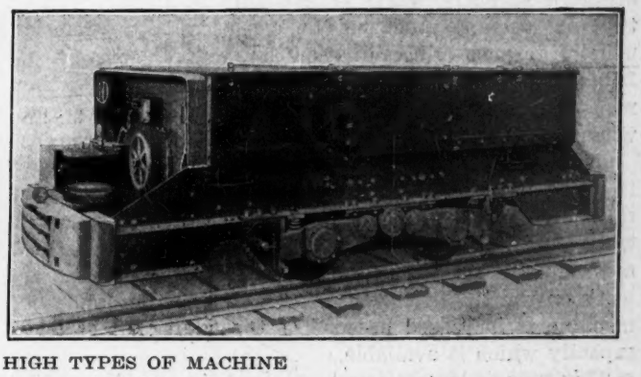
Operating where trolley wire cannot be strung or where the expense of its installation is prohibitive, the storage-battery locomotive replaces mules to great advantage. In some cases an additional saving is secured through not having to take down top or lift bottom to give the necessary height for these animals and their drivers.

For the purpose of this article the development of the "Ironton" storage-battery locomotive will be considered typical of what has been accomplished by manufacturers during recent years in perfecting this means of applying electric haulage to the transportation of coal.

Fig. 1 shows two of the first Ironton machines of the storage-battery type. They were built in 1915 and are still in daily use and giving as good service as when they were installed. Of course, the batteries, which were of the lead type, have been renewed. This picture shows both the low and the high machines. Both are chain-driven but are without the later improvements that eliminated from this drive the difficulties and objection arising from lack of uniformity in the tension on the chain.

This difficulty existed whenever the locomotive was traveling over uneven track and other irregularities, for the warping of the support caused the distance between centers of the sprockets to vary. These latter refinements also provided an easy and rapid method of taking





FIGS. 2 AND 3. LOW AND HIGH TYPES OF MACHINE
These machines are equipped with radial housings and chain adjustment to compensate for wear.

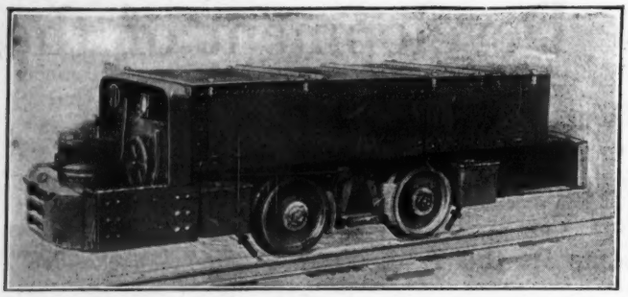


FIG. 4. NARROW LOCOMOTIVE FOR USE IN RESTRICTED PASSAGES

The outside driver is also advantageous whenever it becomes necessary to remove a wheel.

up the slack as the chain gradually stretched from use and wear. These improved features are illustrated in Figs. 2 and 3. Both the low and high type of machine are again shown. The radial housings for the axle bearings and the eccentric adjustment for chain tightening are quite noticeable.

With increasing use of the storage-battery locomotive in gathering work, conditions were met which called for a type of machine that could be used in narrow entries or where timbers had been placed close to the track. The outside-wheel design met this situation admirably. It is shown in Fig. 4. The total width of this type is only a few inches greater than the track gage.

Where the height will permit its use the outside-wheel type has become popular largely on account of the greater facilities for removing the wheels from the axles when such removal becomes necessary. Fig. 5 shows a type of storage-battery locomotive which intro-

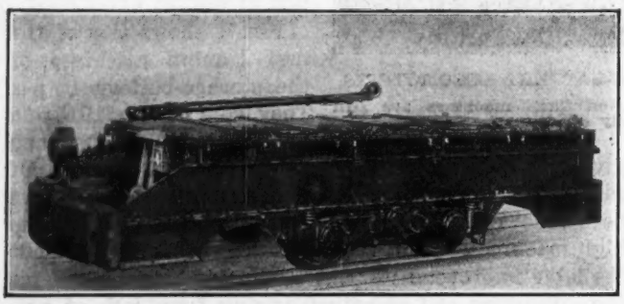


FIG. 5. TROLLEY-RECHARGING STORAGE-BATTERY LOCOMOTIVE

This is not a combination machine but operates continuously on the battery even though drawing current from the trolley.

duced an entirely new feature—that of enabling the battery to be recharged while the locomotive is operating in an entry where trolley wire is strung. This type of machine must not be confused with what is usually termed a combination locomotive, wherein a 250-volt trolley-type motor is used, both when the machine is operating with current from the trolley and when running on the battery.

In the type illustrated a trolley-charging attachment is added to the storage-battery machine. This enables the battery to be replenished while running under a trolley. There are two advantages in this type of locomotive. Besides being able to do a limited amount of work on the trolley its scope as a straight accumulator machine is increased because of the additional battery capacity which is available.

This type of locomotive meets conditions under which the work is beyond the capacity of a gathering locomotive and yet is not of sufficient amount to warrant the installation of main-line trolley locomotive. There also is the advantage of being able to charge the battery to some extent during working hours, thus reducing the time required to charge it afterward.

Another type of storage-battery locomotive which was designed to meet the requirements of haulage rather than gathering is shown in Fig. 6. This machine has two motors, each axle being driven by a separate motor through spur gearing. Large battery capacity is available as the over-all dimensions have not been restricted to suit low coal or narrow entries. Accumulator locomotives in which the axles are driven individually by separate motors do not develop the drawbar pull or tractive effort that can be obtained from machines

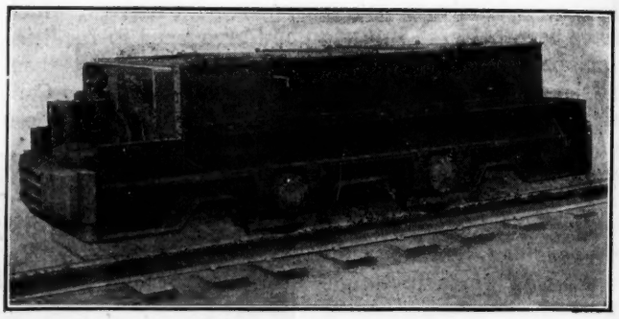


FIG. 6. A TWO-MOTOR STORAGE-BATTERY LOCOMOTIVE

Each pair of drivers is actuated by its own motor.

wherein the axles are connected and all four wheels are driven simultaneously.

Under unfavorable conditions individually operated motors do not divide the load equally, and yet it is under just such circumstances that the maximum tractive effort is desired. Experience having demonstrated the superiority of the connected four-wheel drive, the problem of designing a one- or two-motor type of storage-battery locomotive for entry hauling and gathering was taken up. The result is shown in Fig. 7. In this locomotive either one or two motors can be used, but as the axles are connected by gearing, the power is applied simultaneously on all four drivers. The result is a provision of maximum tractive effort under all conditions.

It is not expected that this type of machine will supplant the chain-driven gathering type, which has been quite generally adopted. It will, however, be used in service where the chain drive is not as suitable as is the gear drive and in larger sizes where two motors are necessary. This type of locomotive is a notable advance in design and will undoubtedly open the field to still further improvement.

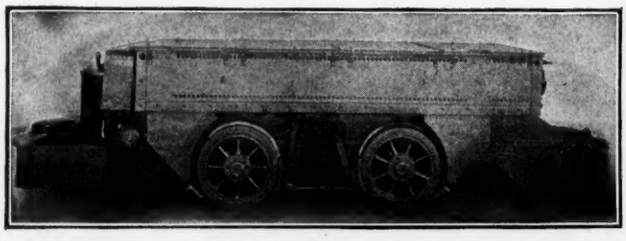


FIG. 7. A LOCOMOTIVE THAT USES EITHER ONE OR TWO MOTORS

The drivers are connected by means of gearing so that all four operate together.

Steam Shovel Has Rendered Operable Many Properties Not Hitherto Worked

Three Large Bituminous Stripping Areas as Well as Many Smaller Ones Now Exist—Steam and Electric Shovels of Special Pattern Have Done Much to Render Profitable Stripping Possible

By F. H. King
Cleveland, Ohio

MORE than 50 years ago a famous English coal-mining authority said, "Our industry will certainly last and grow until our mines are sunk 2,000 or even 4,000 ft. deep. But when that times comes the states of North America will be working in the light of day, quarrying coal along the banks of the Ohio and running it into boats alongside."

Many foreign mines have now been sunk to a depth of 3,500 ft. or more and are approaching the limit of profitable operation. And the fact that coal is now being "quarried" on the banks of the Ohio bears out the prediction above quoted.

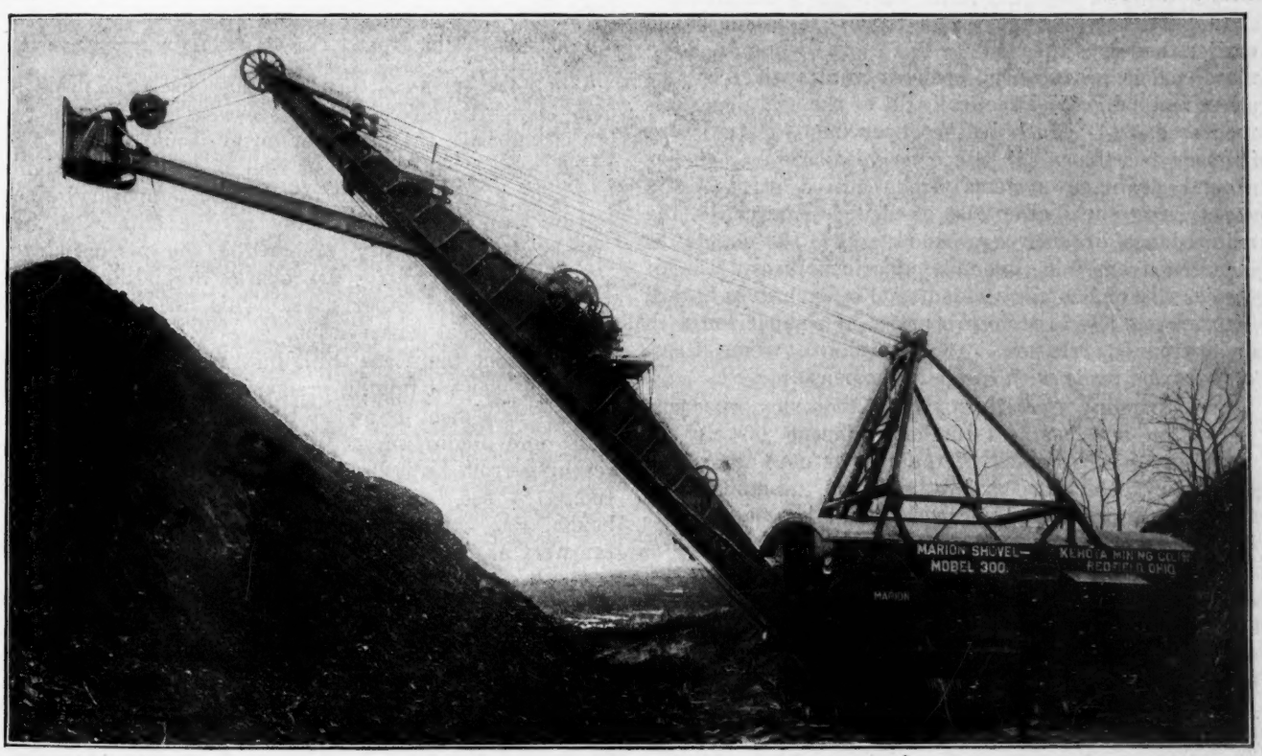
Even now the industry of quarrying or coal stripping is still in its infancy. The introduction of modern methods and machinery into coal-stripping, or open-pit mining, however, combined with the natural advantages of this process over underground mining, is advancing this industry by leaps and bounds.

The history of the development of coal-stripping in this country parallels that of modern labor-saving machinery. Almost since the days of the early settlers stripping has been practiced in a primitive, limited way. Gradually, as the country has become more thickly settled and machinery has been developed from one stage to another various devices have been employed in an effort to make commercial coal-stripping practical and profitable.

During the past twenty-five years scores of methods for removing the overburden from coal have been tried. Among others were aerial tramways, machine scrapers, land dredges and orange-peel excavators. These devices, however, proved so slow and expensive as to afford little real progress toward large-scale production.

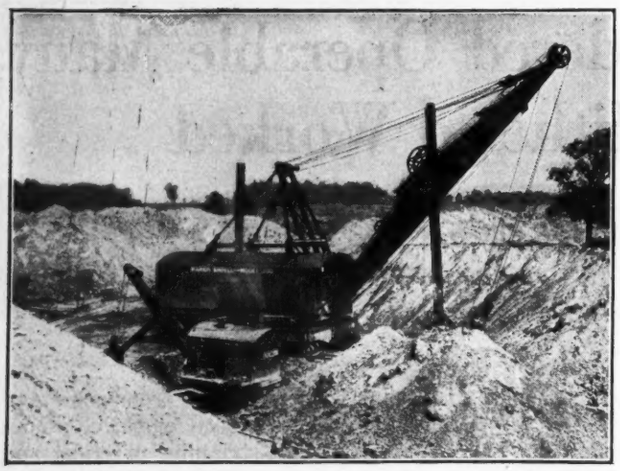
Not until the spring of 1911 was a really successful coal-stripping machine built. This was a model 250 Marion steam shovel that was shipped to Patterson & Hartshorn of Oakwood, Ill. This machine had a 65-ft. boom and carried a 3½ cu.yd. dipper on a 36-ft. dipper handle.

Stripping operators were greatly interested in the "experiment" with this machine. The news that really "did the work" spread rapidly, and coal stripping methods soon underwent a complete change. The steam shovel thus made hundreds of thousands of acres of coal land available for profitable mining.



A MODERN ELECTRIC STRIPPER IN OPERATION

Electricity where available has many advantages over steam for actuating stripping shovels. The electric shovel requires a much smaller crew for its operation than does a steam machine of equal size and capacity.



TWO SHOVELS AT WORK IN A PIT

This combination, a stripper and a loader, is advantageously employed in many operations. In many cases the big shovel has some difficulty in keeping ahead of the small machine.

Today, coal operators everywhere are studying open-pit mining, and "strip" properties have been developed in districts where a few years ago such possibilities would have been scarcely considered. Numerous concerns are centering their efforts in this field, with the result that many operators have acquired stripping territory for immediate or future development.

As a rule, of course, coal mined from shafts or drifts is too deep for profitable stripping, though interesting exceptions have been noted. For example, one company plans to strip a large abandoned mine, estimating that enough coal can be salvaged from the old pillars to pay a profit.

Coal stripping or open-pit mining is coming increasingly into favor wherever conditions encourage its practice, because:

(1) The strip mine yields large production much earlier than does the shaft or drift. (2) Hour for hour, more coal is produced by open-pit mining than by any other method. (3) Practically all of the coal deposit is recovered. (4) Much better supervision of the work is made possible. (5) Since no ventilation or underground drainage systems are required strip-mining saves large sums otherwise needed for purchase and maintenance of such equipment. (6) No danger is incurred from underground explosions, fires, falls of roof or ribs or haulage accidents. The explosives hazard is extremely low in strip properties by comparison with underground operation. (7) Shutdown, when necessary can be made with minimum expense.

Coal-stripping operations, while requiring good organization and business methods, depend largely for their success on the size of the shovels used to remove the overburden. The larger the shovel the quicker the stripping is performed and the sooner the coal is moving to market.

One Indiana operator employs the following equipment in his plant, which has a capacity of 18 to 24 standard railroad cars per day—the tract worked covers 200 acres and the coal bed, averaging 6 ft. in thickness, lies beneath overburden ranging from 8 or 10 to 30 ft. deep:

One Marion shovel of the large revolving type for removing overburden; one small revolving Marion shovel for loading coal; one portable Ingersoll-Rand electric air compressor to operate the drills for sinking holes to shoot the coal; one mile of track and two dinky locomotives with trains of pit cars are installed for bringing coal to the incline; a feed-water pumping plant supplies the boilers, locomotives and shovels; the gravity incline has two 10-ton cylindrical gunboats or monitors for receiving the coal from the pit cars and delivering it to the tipple, which is electrically operated. High tension 3-phase electric power is available from public-service lines extending along the Ohio River. Approximately fifty men are employed in the operation of the plant.

In addition to steam shovels, electric shovels are meeting with favor among coal-stripping operators. Conditions determine which of the two types is the more advantageous to employ.

As to initial price, the electric type is, of course, the more costly. However, this is largely offset by greater production under favorable conditions and a smaller labor crew. A large electric shovel requires a crew consisting of one operator, one oiler and four or five ground men, making 6 or 7 in all. The same model and size of steam shovel needs as crew one operator, one craneman, one oiler, one fireman, two coal handlers, four or five ground men and one water-supply man, making a total of 11 to 12 men.

The two chief drawbacks to coal-stripping are: Layoffs necessitated by bad weather and destruction of land for farming. The first objection is overcome largely by good planning and by shovels mounted on crawling, or caterpillar, trucks which enable them to work readily on a yielding footing. The second objection is met, partly, by the fact that, in some sections, farms had been about completely worked out before mining operations were begun. Still other properties are located in the hills where grades are so steep that equipment has to be dismantled and taken up piecemeal. Here, of course, the question of the destruction of productive farm land does not enter seriously.

Nature Will Hide Landscape Disfigurement

While the strip-coal operator does not take pride in disfiguring the landscape, he senses a justification for it that he feels the public at large should share. The world needs to be warmed as well as fed. The unsightliness of a scarred landscape is but temporary, since Nature will soon cover many of the cuts with her mantle of living green. Meanwhile, the owner has received a good price for a property that still retains a certain value for other uses. This, argues the strip operator, is real conservation.

At present there are three distinct bituminous fields in which open-pit mining predominates: (a) The Kansas-Missouri field lying in the vicinity of Pittsburg, Kan., and Joplin, Mo.; (b) the Illinois-Indiana field, reaching from Danville, Ill., to Terre Haute and Brazil, Ind.; (c) the Ohio-Pennsylvania field between Pittsburgh, Pa., and Steubenville, Ohio, and extending as far west as Zanesville, Ohio.

Contracts for Sale of Coal.—Where a contract to sell coal provides for delivery upon the buyer's order within a certain period, time is presumed to be mutually intended as a vital condition of the contract; and if the buyer refuses to order delivery within the stipulated time, the seller will be under no obligation to make delivery on a belated order. *(Georgia Court of Appeals, Lee Bros. vs. Bewley-Darst Coal Co., 97 Southeastern Reporter, 99.)*

Machinery as an Aid to Labor Conservation and Increased Production*

Relief of Conditions Due to High Prices, Labor Shortage and Curtailing of Working Hours Can Only Be Accomplished by Devices That Will Emancipate Labor

By Rumsey W. Scott

AMERICA has never been found wanting in an emergency. The opportunity for progress in business is as great as at any other time in the history of the country. Resourcefulness, adaptability and the ability to organize and carry on in spite of any difficulties, at any time, have placed America in the forefront of world affairs.

While we have for several years enjoyed unprecedented prosperity, there are many indications that give cause for apprehension as to the near future. The reaction after every great war has brought higher prices of commodities, and in an endeavor to meet the cost increase there has been an advance in wages. It is not in the least surprising that after the greatest of all wars—the most destructive to both life and property—there should be a shortage of both the products of labor and of the hands required to do the world's work. The greatest shortage is in unskilled labor.

Tremendous Labor Shortage To Be Made Up

In a recent statement, William H. Burr, president of the Inter-racial Council, said that there is at present a shortage of four million to five million unskilled workers in this country. He said that the average reduction of the workday from ten to eight hours has resulted in an approximate loss in "production hours" representing the labor of from one million to two million foreign-born workers. Only a comparatively small part of this is likely to be compensated for by an increase in immigration, and the loss must therefore be made up in some other way, or there will follow a slowing down of industry with its consequent hardships.

It is patent therefore that the output per worker must in some way be increased. There has no doubt been a slackening of effort on the part of some workers since the war, but this, I think, is true more of the unskilled than the skilled worker. I have great respect for the intelligence and capability of the skilled American workman, and an unbounded confidence in the resourcefulness and ability of the American employer of labor. There has been, especially in the last few months, an awakening to their responsibility by the employer and the worker, and I am not in doubt as to the successful solution of our great industrial problems through concerted effort and co-operation.

The rapid growth of our country is largely due to the introduction of machinery as an aid to labor in the development of the natural resources with which the United States is so richly endowed. It has been estimated that the use of power and machinery has multiplied the productive capacity per man ten times. It would be difficult to conceive of our not having the railways, the steamship, the electric motor and the dynamo, the telephone, the electric light and the automobile, and the hundreds of mechanical agencies that today contribute to our commerce and comfort. Their use has become commonplace. The widespread use of machinery has completely changed our human relations, and it is my belief that science and invention will play a most important part in the solution of our present and future problems.

Reconstruction Hastened by Machinery

After the Civil War the Southern States possessed far less machinery than the North and a superabundance of cheap labor. The trials of the South during the reconstruction period of many years were great, and rehabilitation was much slower than in the North, largely due not only to the insufficiency of capital but also to the lack of efficient machinery. Modern inventions have almost annihilated time and space in the matter of communication.

Transportation has been revolutionized. While machinery has advanced civilization, it has brought greater individual responsibilities and while it has probably made possible causes for disagreement and dissension, it has also made possible what to us now is most important—means for quick and certain readjustment. It is not only necessary in the present emergency to employ agencies that will rehabilitate industry but ones that will as soon as possible overcome the labor shortage and increase unit production, and in addition enable labor at all times to receive equitable return for its effort.

It is very fortunate that labor in general no longer displays the opposition to the use of machinery that was so evident when the first so-called labor-saving machinery was introduced. Even now we occasionally hear of labor opposing the introduction of machinery and in a few cases causing its destruction, but such cases are now rare and solely due to ignorance, and the opposition is usually from unskilled foreign labor.

Labor Unions Favor Labor-Saving Devices

The following is quoted from a statement made by Samuel Gompers, president of the American Federation of Labor, in an interview with Samuel Crowther, recently published in *System*: "There is an impression that the unions are against machinery and against better ways of doing business, and against scientific management, and in favor of stringing out every job to the greatest possible extent. That, it is true, was the attitude of the old country. It is not the attitude of the American labor movement. The unions at one time opposed the introduction of machinery because both the workers and the employers saw labor-saving machinery not as an aid to production but simply as a substitute for men.

*Address delivered at the meeting of the Chamber of Commerce of the United States at Atlantic City, N. J., Wednesday, April 28, 1920.

"I am in favor of every possible mechanical device that can substitute for human labor, but if the employer looks at the machine solely as an instrument to take employment from men he is bound to fail, just as are workers who oppose machinery because it is going to cost them their jobs. This is the short-sighted view. The workers can break the machines and they can destroy the blueprints, but the idea remains, and if it is a good idea it will be put into force. Otherwise we bar the economic progress of the world and encourage instead of prevent waste."

This statement, coming from the recognized head of the better element of American labor, is of great importance. To hold to any other view would point to retrogression and decadence.

In my opinion it is a mistake, especially at this time, to use the time-worn phrase "labor-saving machinery." The labor we have should be conserved and released for the work that only human hands can perform, and to direct the machine that has not "saved" but emancipated labor.

Interchangeability an Aid to Production

In every manufacturing industry there has been a great development in the construction of machines to aid labor and increase productivity. The making of tools for the building of accurate machinery led to the system of "interchangeability," and this marked a great advance in the increase in output of the individual and a lowering of the cost of production. The manufacturers in the United States were the first to establish this practice, one which other countries have not been slow to adopt.

The next important advance came in certain lines where it was practicable to standardize the product. Probably in no field is this so successful as in the manufacture of motor cars. Following standardization came the use of one-purpose tools and automatic machinery. This has greatly speeded up production and reduced costs, and has enabled labor attending these machines to soon become skilled in their operation, and at much higher rates of wages.

In the last few years manufacturers and employers of labor have recognized the necessity of devoting thought and attention not only to the perfection of methods and machinery, but to the welfare and development of men. Probably no element of business is now receiving—certainly there is none that should receive—more careful attention and thought than the satisfactory relation of employer and employee. This is a subject so fertile and vast in its scope that the time at my disposal does not permit of its discussion.

Economy of Progressive Production

Attention has thus far been principally directed to the aid of the machine in the conservation of labor and increased production. May I now ask your attention to an element in manufacturing which offers great opportunity for improvement and economy?

A new phrase of comparatively recent origin is descriptive—"progressive production." This has been highly developed in certain industries, such as paper making, the manufacture of automobiles, of machinery, the steel industry, packing industry, etc. This involves not only the placing of the different processes of manufacture and the machines in their proper relation but the proper routing of materials and the employment of efficient means for their transference. The greater the possibilities of standardization of product, the more readily adaptable is the system to use.

Machines for the conservation of labor in the transfer of materials are of many types and have been highly developed. Many of them have dispensed with large numbers of laborers. Machinery of this type relieves labor of its drudgery, and its use is almost indispensable.

The handling of bulk materials has been perfected to a remarkable degree. Huge machines which are capable of automatically raising and dumping 110 tons of ore from railroad cars into steamers are operating at the amazing low cost of from ½ to 1½ c. per ton. Machines operating scoops holding seventeen tons are now removing ore from steamers and unloading it into freight cars at the rate of 520 tons per hour at a cost of approximately 2.4 c. per gross ton.

Coal conveyors are in use in great numbers at terminals, at public utility plants and at manufacturing plants, and are remarkably efficient. At a number of plants coal is now being loaded into colliers by car unloading machinery which automatically lifts, overturns and dumps a car of 110 tons of coal. Automatic machinery is used in coaling ships, almost entirely eliminating labor. Each machine is capable of delivering 100 to 150 tons per hour from a lighter to the ship, making it possible to coal the Leviathan in a single day.

Cranes and hoists are built for almost every purpose. The traveling shop crane is indispensable in plants where heavy loads are to be handled. There was recently completed at the Philadelphia Navy Yard a lifting crane of the tower type capable of lifting 350 gross tons. Electric hoists swift in motion are used for hoisting and transferring machines and materials in plants. Electric cranes and hoists of many types are used in economically and quickly loading and unloading ships and railroad cars.

Electric Truck Reduces Transfer Costs

The electric industrial truck has come into very general use at railroad stations, terminals and in industrial plants, and with its aid the opportunity for speeding up and reducing the cost of transferring goods is very great. Trucks are now made which not only carry the load but elevate the goods so as to permit of stacking, which reduces labor and increases the storage capacity of the floor. The industrial truck used as a tractor in connection with a train of four wheel trucks provides an excellent means for the handling of materials and commodities. It is a system that gives flexibility and has the advantage that trucks can operate over an area and are not restricted to a line, as in the case of continuous conveying devices.

Only a few of the more important of material handling machines have been referred to to show the possibilities in this field alone in increasing production and conserving labor. Machinery is now available to perform almost every duty now performed by human hands. Machinery will be constantly perfected to meet new requirements. The possibilities are almost without limit. Economic necessity absolutely demands the use of machinery wherever possible.

By contact we learn of what others are doing and what may be accomplished. By confidence we learn better understanding and a greater respect for the viewpoint of others. By co-operation we learn how to plan and work together and bring about mutual understanding. In closing may I leave the thought expressed by these three words: contact, confidence and co-operation.

Cagers at Shafts Facilitate Hoisting

Cagers, Both with Single and with Double Pairs of Horns, by Feeding Cars Regularly to the Hoisting Cage, Tend to Make Mine Operation Steady and to Reduce Labor Cost

By N. L. Harmon
Bowerston, Ohio

In order to cope successfully with the larger outside difficulties in the market, operators must be freed from unnecessary annoyances at the mines. If they can produce more coal, lessen the cost of production and avoid delays and wrecks by wider use of labor-saving machinery, granted only that they have railroad cars on the switch, they can be assured of meeting advantageously all the problems of distribution. Among devices that are being installed to increase production and lessen cost may be mentioned the automatic safety mine-car cager invented by James A. Nolan, manager of the Mining Safety Device Co., of Bowerston, Ohio.

FIG. 1. SHAFT BOTTOM OF THE COAL RIDGE MINING CO., LINTON, IND.

The left hand cage is down and a loaded car is in place upon it, ready for hoisting.

FIG. 2. ANOTHER VIEW OF THE SAME INSTALLATION

Note the cager horns on both tracks, the one pair open for decaging and the other closed against the passage of cars.

While this cager is developed along the lines of others of the same firm, yet in many respects it is a departure in that class of construction. Fig. 1. shows the equipment at the mine of the Coal Ridge Mining Co., of Linton, of which B. O. Rook is general manager. Mr. Rook was the first to install this type of cager at a shaft bottom, though it must be admitted the Johnston City Coal Co., in the town of Johnston City, had given the matter of installing the cager earlier consideration and had placed the order a day before Mr. Rook. The delay of that company arose solely from the fact that it was not ready to install its cager as soon as it arrived.

Several details of this machine which distinguish it from others assist in the solution of the problems of automatic caging. Instead of a round rocker shaft with bell cranks keyed and pinned to it, the rocker shaft in this case is square and the bell crank is made with a square hole to slide on the shaft, carrying the turnbuckles with it.

Long buffer springs are used to cushion the horns

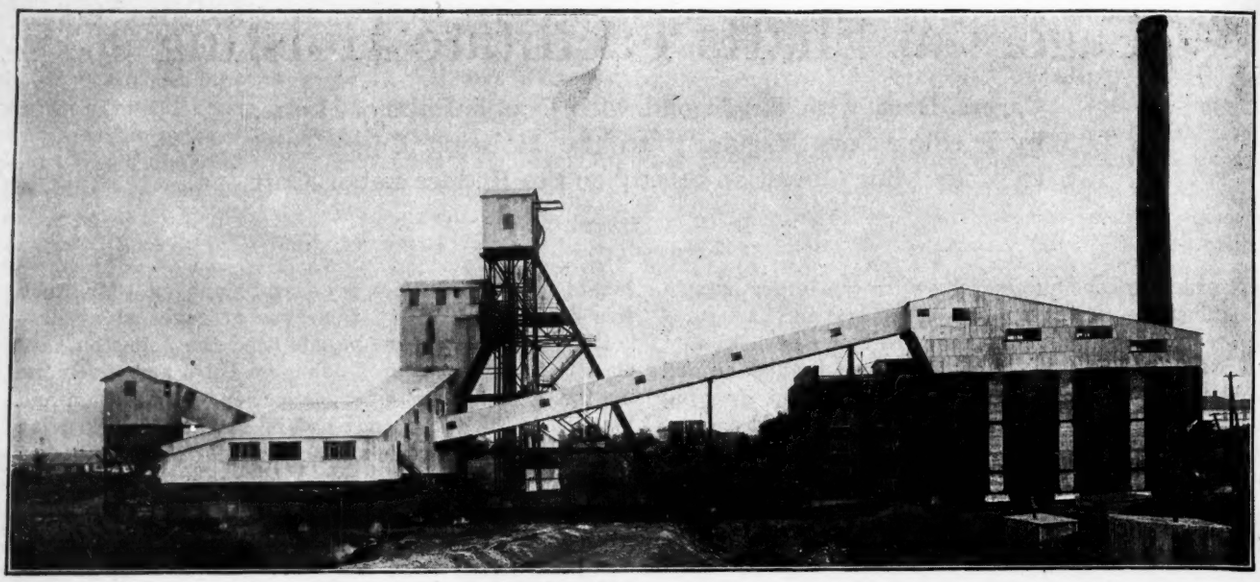


FIG. 3. UPPER WORKS OF THE ORIENT MINE OF THE CHICAGO, WILMINGTON & FRANKLIN COAL CO.
This operation holds the record of 6,777 tons in eight hours. The shaft bottom is shown in Fig. 5.

and absorb the impact of the loaded cars. At some mines the car axles are weak, but even the weakest of axles cannot be bent by coming in contact with the horns of this cager. Neither is it possible for the cars to climb the horns or telescope bumpers. The cager is operated both by the cage and the car. The descending cage opens the horns by depressing the trip crank attached to the rocker shaft. The loaded car passes to the cage and in so doing moves the reset block from the rail, revolving the rocker shaft and closing the horns just back of the next advancing loaded car. In order to close the horns before the cage leaves the landing, a novel feature is employed, namely, a two-piece trip crank, instead of the usual one-piece crank. A pin on the cage depresses the trip crank and then passes beyond it. The closing horns bring the trip crank back into place and when the cage rises the two portions of the crank separate and allow the pin on the cage to pass by. The double-acting tension spring attached to the rear of the rocker shaft assists in throwing the shaft into either of its operative positions. Moreover, it carries the trip crank past the point where it is released by the pin on the cage

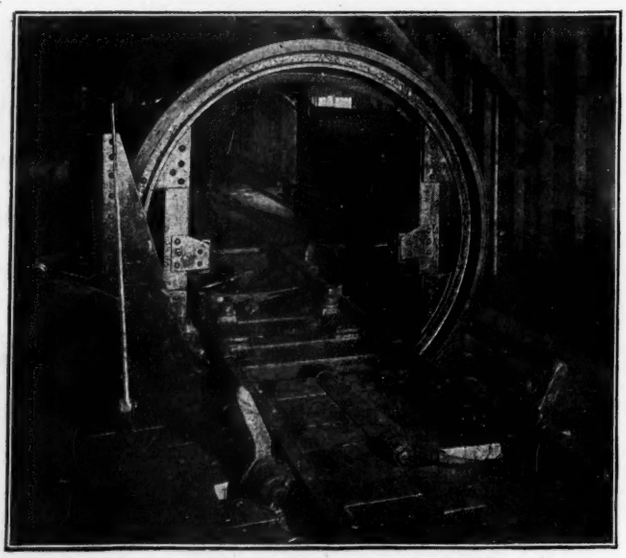


FIG. 4. ROTARY DUMP INSTALLED AT CASSIDY'S SIDING, VANCOUVER ISLAND
Horns of the cager in the foreground, admit cars to the dump or prohibit them from entering.

FIG. 5. SHAFT BOTTOM OF THE ORIENT MINE
Everything must be "shipshape" and automatic to enable a mine to secure and hold the world's hoisting record. The cager horns on the right having permitted the passage of one car are now set against the approach of another.

At Last, Heavy-Duty Quintuplex Mine Pump Driven by Condensing Steam Turbine

Will Raise 2,100 Gal. of Water Per Minute in Kingston Coal Co's Shaft —Lift Will Be 700 Ft.—Steam Consumption Under 14.7 Lb. Per Horsepower Hour Guaranteed—Large Saving in Room Required

BY ERSKINE L. SOLOMON
Kingston, Pa.

IN THE never-ending quest of economy a number of coal companies decided a few years ago to replace wasteful pumping and generating units with more modern equipment. In some cases, however, ease of installation appears to have been sought rather than economy, for in few of the pumping stations have the best results been obtained.

High-duty pumping engines of the corliss or poppet-valve type operating condensing are ideal from an economical point of view, but the space required for their installation renders them unfitted for use in the mines. Steam turbines, on the other hand, require but a small amount of space as compared with corliss engines of the same horsepower, which with a guaranteed low steam consumption presents a combination that no other prime mover can match.

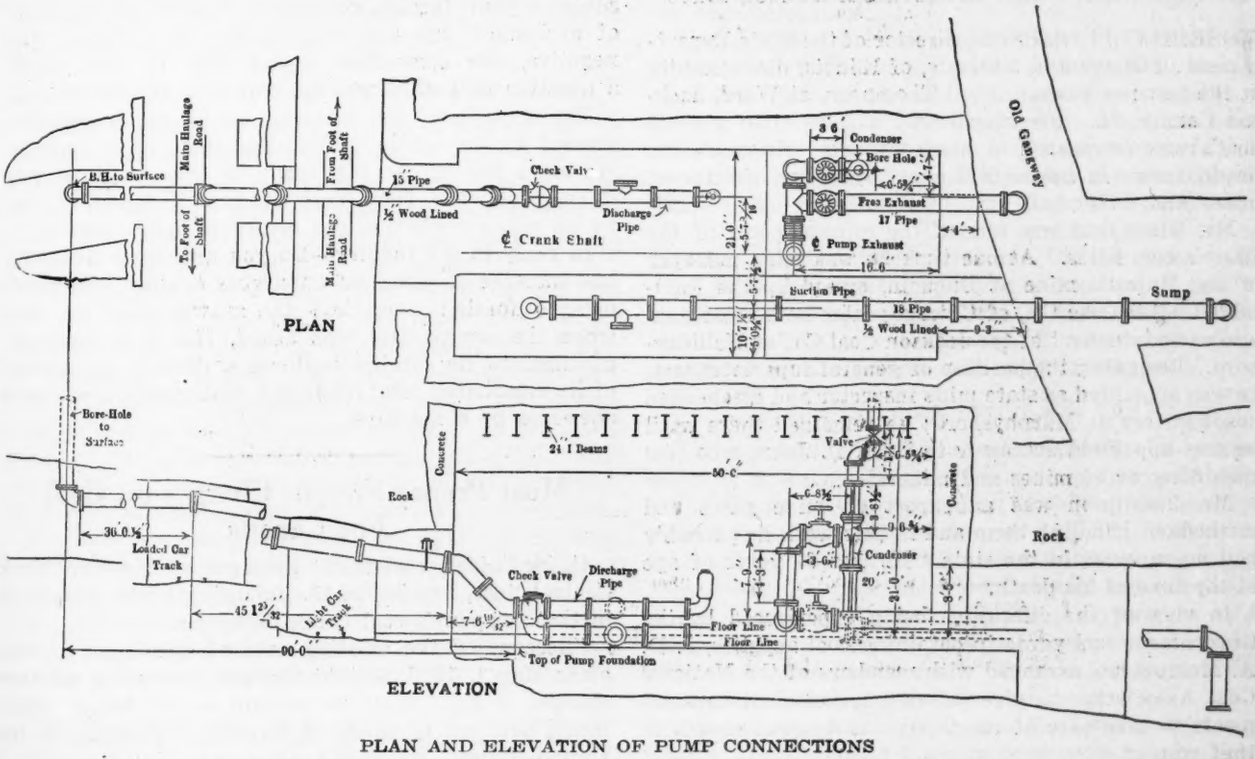
To apply a machine of this type to a mine pumping unit was a radical departure from usual practice, and the combination for a time could not be effected because of the high speed at which turbines operate. With increased perfection in reducing gear, however, means were provided whereby steam turbines could be attached to certain types of pumps, whereupon the Aldrich Pump Co. was requested to furnish a quintuplex pump arranged for steam-turbine drive.

A satisfactory arrangement finally was devised and a unit ordered, but the delivery of the turbine was delayed because all equipment of this kind was taken by the Government during the war. As a result the complete unit was not delivered until a few months ago. Recently this combination operating condensing was placed at work in the No. 4 shaft of the Kingston Coal Co. in the Red Ash bed at Kingston, Pa.

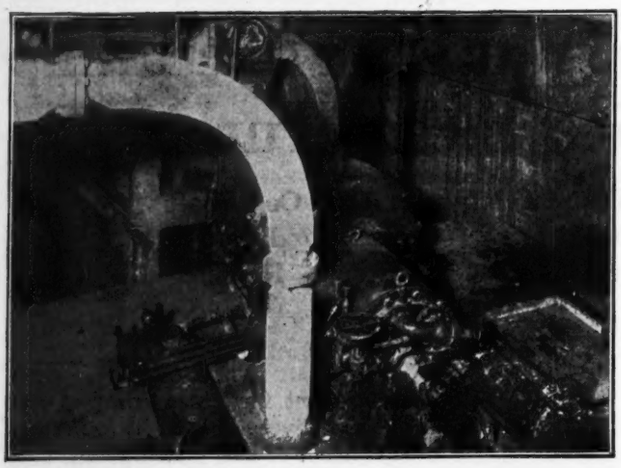
The pumping unit consists of an 11 x 18-in. Aldrich vertical, quintuplex, outside packed plunger unit, of the pot-chamber, water-end type. Its capacity is 2,100 gal. per minute against a 700-ft. head. This pump is driven through Falk herringbone gears and an Aldrich flexible coupling, by a 500-hp. Kerr economy, horizontal, multi-pressure stage, steam turbine operating at 4,800 r.p.m. This machine has horizontally split casing, diaphragms and bearings.

The turbine is equipped with a standard governor of the latest type, an oil pilot control for operating the governing valve, also an overspeed governor, and quick-closing trip and throttle valve. A hand-operated overload valve for non-condensing operation is provided as well as a speed-changing device that permits varying the speed 10 per cent while the machine is in operation.

The turbine is connected through a flexible coupling



PLAN AND ELEVATION OF PUMP CONNECTIONS
In the discharge line "dutchmen" have been used to secure small changes in direction



PUMP AND ITS DRIVING TURBINE
Compare the diminutive size of the prime mover with the bulkiness of the machine it drives.

of the pin-and-bushing type to double helical herringbone reduction gears that reduce the speed from 4,800 to 600 r.p.m. The entire unit is lubricated under pressure, the oil being pumped to all main bearings, gears, etc. Guarantees has been given that the steam consumption, including gear losses, will not exceed 14.7 lb. per horsepower-hour.

The condensing equipment consists of a 20-in. Eynon & Evans barometric condenser with iron body and white-metal water combining and discharge tubes. These parts are made of a special metal so as to resist the acidulous action of the mine water used for condensing. The condenser is supplied with water through an 8-in. bore hole from the coal bed above. An automatic balance valve is provided for free exhaust.

Illinois Mines and Minerals Director Dies

JOSEPH C. THOMPSON, director of the State Department of Mines and Minerals, of Illinois, died recently at the home of his son, Fred Thompson, at Ward, Jackson County, Ill. He was ill only a short time and his death was attributed to heart failure. He made his headquarters in Springfield since becoming director of mines and minerals.

Mr. Thompson was one of the mine experts of the Illinois coal fields. At one time he was mine manager of the Majestic mine at Duquoin, owned by the Equitable Coal & Coke Co., of Chicago; later he became general superintendent of the Jackson Coal Co., at Hallidayboro. Resigning the position of general superintendent, he was appointed as state mine inspector and established headquarters at Murphysboro; he remained there until he was appointed successor to Evan D. John, who was then director of mines and minerals. ?

Mr. Thompson was an expert on mine gases and methods of handling them and in this work he probably had no superior in the state. He was 65 years of age at the time of his death.

In view of the difficulties being experienced by the Government fuel yards in obtaining coal supplies, J. D. A. Morrow has arranged with members of the National Coal Association to give priority to sufficient consignments to take care of the Government requirements in that respect.

Export Association Discusses Foreign-Trade Prospects

SPEAKING for a group representing manufacturers of coal and oil, H. M. Payne, assistant to the president, Bertha Coal Co., at the "Commodity-Group Luncheon" of the American Manufacturers' Export Association held at the Hotel Pennsylvania, on April 21, replied to seven questions which had been presented to each group that the consensus of its opinion might be secured. The coal-and-oil group consisted of seven coal men and four oil men. In answer to the first question: "Have the foreign exports in your line been absolutely or materially curtailed by the present condition of foreign exchange?" Dr. Payne replied that the unfortunate condition of foreign exchange has not materially curtailed the coal-export trade. The countries take whatever they need and are able to get.

As to the second question, to wit, whether any anticipation existed in the mind of the committee that foreign exports will be stopped or materially reduced in the next six months, the answer of the coal group was that the demand is so great that the exportations of coal are limited solely by the capacity of the piers over which the coal is loaded. The committee declared that it confidently expected that the coal men would be operating at the maximum capacity of the tidewater piers within the next year.

In reference to the question—In which countries do your customers show evidence of financial recuperation? the committee replied that both the groups were unanimous in the opinion that England has recuperated most, but there is a difference of opinion as to whether Belgium or Italy should take second place and France third.

When considering the problem of whether it is advisable to accept deposits abroad against invoices, the committee replied unanimously that it was not advisable. The fifth inquiry—Do you require, or are you advising your foreign customers to purchase "future" of exchange? was also unanimously answered in the negative, the committee saying that it was purely a question of credit, whether business is done or not.

The attitude of the coal and oil groups is best expressed by the words: "You may take it or leave it. We have the oil or the coal. If you want to pay it in established New York credit, all right; if not, we do not care whether you establish credits or not."

In reply to the inquiry—Do you anticipate any general increase on duties or embargoes against your products to foreign countries? the answer was No, and when the commmittee was asked, Has your company allocated to its foreign business a definite percentage of its established total products? that question was also answered by a negative.

Must Prepay Freight Charges on Coal For Canada

G. N. Snider, coal traffic manager of the New York Central lines, has issued the following notice to agents in that company's coal traffic department:

"Because of the existing rate of exchange, on and after May 1, 1920, freight charges (including advance charges if any) must be prepaid on all freight shipments destined to points in Canada originating in the United States."

Outlaws and Profiteers Have No Place In Retail Coal Trade*

Favoring a House Cleaning by Retail Coal Merchants, Officer of Association Would Welcome Accurate Definition of What Constitutes Profiteering—Merits of Each Case Should Be Considered

By Ellery B. Gordon†
Philadelphia, Pa.

THE Attorney-General of the United States, A. Mitchell Palmer, had an article in the October, 1919, number of *The Nation's Business*, in which, after making the statement that "profiteering probably has existed since the beginning of commerce," he attempted to give his idea of what profiteering is.

He admitted that the term as commonly used is not susceptible of exact definition. It cannot be said that a man who makes 10 per cent, 20 per cent, or 30 per cent, or more profit is profiteering. "Anyone who makes more than a just and reasonable profit is a profiteer. Whether he does this must be separately determined in each case, taking into consideration the conditions in the locality, the nature of the commodity, and the other facts relating to the particular transaction." Aside from the difficulty raised by the use of the word reasonable, we believe this is a very "reasonable definition."

A United States Senator recently stated in a committee hearing that anyone is a profiteer who makes more than 6 per cent if his business involves no risk, and 10 per cent of it does involve a risk. He meant "on the turnover." As a matter of fact, however, there are many operators and retailers who would like to approach even half way to this limit.

The retail coal merchant has been interested in this question as to what a reasonable profit is perhaps more than in any other one point. While the Fuel Administration was controlling retail prices the state fuel administrators exhibited almost as many opinions regarding profits as there were administrators.

Legitimate Business Entitled to Fair Profit

Without going too much into past history let me cite the practice in New York State. The Fuel Administrator at the start was a business man and most of his county and local administrators were business men. They recognized the fact that legitimate business enterprises were entitled to a fair profit.

It was urged upon the state administration that 50c. per ton was a fair profit. Offhand this sounds reasonable. As a matter of fact, however, it was only on tonnages of medium size that this profit was permitted, while in large communities, where the average retailer handled a large annual tonnage, the net profit aimed at was about 25c. to 30c. per ton. In small towns, the other extreme, where the dealer is just as necessary, even 50c. a ton would not have been a fair return.

But that was two years and more ago. The current capital necessary to conduct a retail business today has increased over two years ago by 20 per cent to 30 per cent. Mine prices advanced under the Fuel Administration and freight rates advanced under Mr. McAdoo, and yet we are still talking of 50c. and 25c. Let us right now recognize the general price advance—it is but fair; where 50c. was a fair profit two years ago, 60c. is certainly no more than fair now.

Of course, the question of the return on investment was taken into consideration in the case of the medium and large sized tonnages. The very small merchant, however, who must at least make a living, must not be held to a small percentage return on his investment. If he handles 2,000 tons a year or 3,000 or 4,000 tons a year, his investment may be so small that even 100 per cent return on it would not mean living wages. Return on investment must, therefore, be ignored in many cases. A 2,000-ton annual business means, in dollars, probably upward of $20,000. A 10-per cent profit on *sales* would be less than present wages.

Coal Business Is One Involving Risk

While we are speaking of profits in concrete terms it is to be remembered that the figures mentioned may be called "paper profits." They represent the amounts that were added to the ascertained cost of doing business for a past period of six months or a year; but they didn't actually pan out. For instance, with gross margins fixed to produce a net profit of 50c. per ton on domestic sizes, and 25c. on small sizes, with the intention of averaging about 35c. per ton net profit, the result at the end of the year during which this order was in force was a net profit of only about 18c. per ton in a representative case.

To say that the retail coal business involves no risk is not true. While an investment in equipment, storage facilities, etc., is essential, an additional capital is needed to handle accounts receivable, which in some cases known to the writer amount to an average of over one dollar per ton of annual business the year round. There is the same business risk that other retail merchants are exposed to. Unquestionably there is not as great a risk as mining involves. On the other hand, most mining operations result in a business of tens of thousands of tons, while the average retail coal business is less than 7,500 tons per annum. The factor of volume cannot be overlooked in considering profits.

What Is a Fair Profit Per Ton?

The question has been asked repeatedly in conventions of retail merchants, "What is a fair profit per ton?" Some have been assumed to answer the question with a flat figure such as 50c. or $1. This makes me think of the remark of a railroad president regarding some rules that had been worked out and presented to him for approval. After looking them over he said, "Yes, very good. I have only one thing to say. Rules must be flexible to succeed." No rule for profit-fixing can be successfully applied everywhere.

Under the Fuel Administration in Massachusetts, according to a statement made in conference by the New

*Address delivered at the annual convention of the Indiana Retail Coal Merchants' Association, at Indianapolis, April 28 and 29.
†Secretary-Manager Retail Coal Merchants Association.

England Fuel Administrator, the retailers were permitted just enough to "keep body and soul together." The Chicago gross margins were based on an intended net profit of 25c. to 35c. per ton. The New York basis is outlined above. Nothing like excessive profits were permitted under the fuel administration, generally speaking. In fact not even war profits were permitted. Here in Indiana, I understand, net profit was considered entirely unnecessary!

The retail coal merchants generally did not increase their margins during 1919. In many cases of which I have detailed record the margins decreased slightly and in other cases where margins were increased they did not keep pace with the increase in cost and profits. In some instances they decreased or even disappeared.

Retailer Forced to Increase Margin

The retailer therefore in the beginning of the new year, facing additional wage increases in nearly all parts of the country, has been obliged to increase his margin. No fair-minded person would ask him to do otherwise. We have run into a perfectly natural temporary upheaval or disturbance in the coal market due to the removal of restrictions that have been in force practically during the last three years. The situation is not nearly as alarming as a great many calamity howlers would like to have us think. The only alarming feature of it is the fact that there is a small percentage of the trade, including the operators, the jobbers, and the retailers, who are not only their own worst enemies but are enemies of the entire coal trade.

We are in a way on trial. There is no question about it. We have hanging over us now very drastic legislation. Let us not deceive ourselves into thinking that it is so drastic that it cannot possibly pass. It can very easily be revised and passed, unless during the next few weeks and months the coal trade itself shows that it does not need such regulation.

I want to make a few very plain statements of opinion.

First. I know that 95 per cent of the retail trade is honest and fair and wants to take no advantage whatever of market conditions. Ninety-five per cent of the trade is convinced that it is entitled to a fair profit and that is all they are going to take. I believe the same is true of an overwhelming percentage of the operators and of a large percentage of the wholesalers. It is the other 5 per cent that worries us.

Favors House Cleaning by Coal Men

That 5 per cent among the operators, who because the demand is heavy sit back and say "I can get $5 for my $3.50 coal and I won't sell it for any less," and the wholesaler who knows that from certain buyers who are overexcited he can get $10 at the mines for his $7.50 anthracite coal; and that retailer who because his consumers are alarmed asks $4 gross margin when $3 or $3.25 is a fair margin; all these are outlaws. They are just as much enemies of the coal trade and of the public as are any other profiteers.

Let us clean house!

Let us make it understood in no uncertain manner that we as organized coal merchants do not condone or tolerate speculative coal prices on the part of the operator and wholesaler, nor profiteering upon the part of the retailer. There is more than one way of being a profiteer. The retailer who allows himself to be stampeded into encouraging high mine prices by bidding against the market, and the operator who permits himself to accept these bids simply because they are offered, are just as guilty as those who deliberately figure that now is the time to make a killing and set about doing it.

Now is the time to keep our heads!

Let those who have the high-priced coal to sell keep it. Let the consumers who are overexcited wait. Explain to them as well as possible. Let the man who sees fit to buy his high-priced coal sell it at excessive prices. But let him be the only one in your market who is doing it. Then if a crash comes those who are to blame will be easy to find.

I said, "Let us clean house!" I meant let us clean our own houses. I didn't mean to invite the operators to come and clean our houses for us. It has become a great game this "passing of the buck" on account of the high prices, and the coal trade, which is notorious for a lack of unity and co-operation, is dividing itself again in the same way. Let us all recognize that all but 3 per cent or 4 per cent or 5 per cent of all branches of the trade are honest and fair. Let us not make general accusations. If we know of specific instances let each branch take care of its own troubles.

I have in mind a warning to coal retailers which I saw in the *West Virginia Mining News* about two weeks ago. It said that "Evidence is before us that some retailers of coal are charging more than is justified by the price at the mines, plus freight and expense of handling and a fair profit. If this practice is continued this paper will publish the names of those doing so, and all facts in connection; then will circulate bulletins in the communities where such retailers do business, exposing their methods. In other words, retailers are not going to 'get by' with laying the blame for high coal prices on the mine operators—not this year." The editor of the *West Virginia Mining News* is Mr. Wightman D. Roberts and its office is at Charleston, W. Va.

Operator Ignorant of Fair Retailing Profit

In the first place, Mr. Roberts may know mining but I doubt very much if he has any idea what a fair profit for retailing is. I am sorry I am not personally acquainted with him. Anyway, if he knows of any retailers who are getting more than a fair profit, we should be just as glad to have them exposed as anybody else. If he should publish any names, however, we should be obliged to see that the invoiced prices for the coal which they bought, together with the names of the shippers, also were published. If there is going to be any exposure it will have to be complete.

Now I may have used some pretty strong language, but it is time that the coal trade took itself in hand and stopped kicking about conditions when a considerable part of the blame, for the price conditions at any rate, is strictly up to the trade itself. It is time that we settled down to manage our own business in a business-like way, and let those whom the profiteering coat fits put it on.

As long ago as last September I tried to impress the retail branch of the trade particularly, but it applies also to the entire coal trade, with the fact that our destiny is in our own hands. I remember telling a story that illustrated what I have in mind, and it is worth repeating.

I stated at that time that we cannot afford to be like the man in the grocery store who was approached by an

old gentleman with a stick in his hand, with the following question:

"Did you drive up here in a cart?"

"Yes, I did," was the answer.

"Was it an old white horse?"

"Yes."

"And an old woman on the seat?"

"Yes."

"And can she manage that horse?"

"I should think she can."

"Then it's all right," said the man with the stick. "The old horse is running away and the old woman is hanging to the tailboard, shouting 'Murder!' with all her might; but if she can manage it there is no use of anybody getting excited over it."

We are trying to be sure that the old horse does not run away and get us into trouble.

Central Pennsylvania Decides On Wage Scale for 1920-1922

AFTER sessions continuing over a period of three weeks and held in Philadelphia, representatives of the Central Pennsylvania bituminous operators and mine workers agreed upon and signed a wage agreement on April 27. The contract is for a period of two years, from April 1, 1920 to March 31, 1922, and runs as follows:

OUTSIDE DAY-WAGE SCALE.

Occupation	Rate per Day
Car cleaners	$5.10
Pushers	5.18
Trimmers	5.36
Dumpers	5.42
Ram operators and Firemen now working on change shifts of eight hours each	5.60

INSIDE DAY-WAGE SCALE.

Occupation	Rate per Day
Trappers	$3.18
Wiremen's and Tracklayers' helpers	5.77
Scrapers	5.85
Pipemen	5.92
Spraggers, Skilled wiremen in charge of work, Tracklayers, Bottom cagers, Drivers, Trip riders, Water and Machine Handlers, Timbermen	6.00
Motormen	6.10
All other inside day labor	5.77

TONNAGE RATES.

Work Performed	Rate
Pick mining per gross ton	$1.2428
Pick mining per net ton	1.1096
Machine loading per gross ton	0.8434
Machine loading per net ton	0.7531

INCREASES IN TONNAGE RATES OVER PRICES IN EFFECT OCTOBER 31, 1919.

(Less 5 per cent bonus on 1916 contract prices).

Work performed	Advance in rate
Cutting, scraping and loading per gross on	$0.2688
Cutting, scraping and loading per net ton	0.2400
Cutting and scraping per gross ton	0.0511
Cutting and scraping per net ton	0.0456

All rates on deadwork and yardage in effect Oct. 31, 1919, shall be reduced by the amount of the 5 per cent bonus granted in the 1916 contract prices and then shall be increased 20 per cent.

All other outside able-bodied day labor, excepting the men herein above mentioned, shall work the same hours and at the same rates as at present, plus an advance of $1 per day over the prices in effect Oct. 31, 1919, based on the present standard number of hours now constituting a day's work under such employment at each operation.

All boys under eighteen years of age receiving on Oct. 31, 1919, less than a man's wages, shall be advanced 53c. per day based on the present standard number of hours now constituting a day's work under such employments at each operation. All monthly men shall be advanced $1 per day over the prices in effect Oct. 31, 1919, based on the present standard number of days and hours constituting a month's and a day's work under such employments at each operation; provided, however, that this clause shall not apply to mine foremen, assistant mine formen, firebosses or bosses in charge of any class of labor inside or outside the mine, or to coal inspectors or weigh bosses.

All labor engaged in the manufacture of coke shall be advanced at the rate of $1 over and above the prices in effect Oct. 31, 1919, with the exception of boys under the age of eighteen years, who shall be advanced to a minimum wage of $3.53 per day. The application of said advance in both cases mentioned in this paragraph to be based on the present standard number of hours, average ovens drawn, and average cars loaded per man, now constituting a day's work in such employments at each operation.

The advance in the price of all house coal shall be 27 per cent. At all mines where cars are pushed both ways by the miner, the operator shall pay for this work the sum of 5c. per gross ton or its equivalent net. Whether the operator reduces the car pushing work to a one-way push, the direction being at the choice of the miner, the compensation shall cease. This clause shall not be taken to authorize an adverse charge where cars are now being handled by the company one or both ways.

Want a Seven Per Cent Advance

DRIVERS in a number of East-Side coal mines near East St. Louis are seeking by a strike to obtain a 27-per cent increase in wage in place of the 20 per cent increase which was granted them by the Bituminous Coal Commission. It is an old practice of union men to play up the wrongs of a certain class of men who have profited least by past wage increases and then seek to extend their advances over the whole body of workmen regardless of the fact that in the recent past most of them have received larger increases than those that have been complained of. Thus it was the hope of the union that the wages of all union men would be increased considerably because the pick miner, and only he, could make just claims to such an increase.

The day workers would have bygones be bygones and have their wages as generously advanced as those of the miners. The union has given its approval to the decision of the commission and cannot therefore allow the drivers to demand more than the commission awarded. It is, therefore, prepared to take away the union cards from the drivers who have left their work, laying the mines and their co-workers idle. An increase of $1 per day is all to which they can lay claim and they have no right to demand more nor, by refusing to perform their accustomed work, to lay off thousands of miners in Madison, Macoupin and St. Clair counties.

Company Gets $300,000 Damages

AS THE RESULT of a suit charging a violation of the Sherman Act, the Pennsylvania Mining Co. has obtained a verdict at Fort Smith, Ark., for $300,000 as against District No. 21 of the United Mine Workers.

Seasonal Coal Freight Rates Supported by Government Officials

Hearings on Frelinghuysen Bills Have Developed Support of Operators in Middle West and of Federal Officials, But Have Shown Opposition of Eastern and Far Western Operators and Railroads

HEARING on the seasonal freight rate and the Coal Commissioner bill were concluded, as far as bituminous coal is concerned, by Senator Frelinghuysen on Thursday, April 29, after two days' hearings at which further testimony opposing the bill was introduced. The strongest proponents of these measures to stabilize the coal industry heard last week were Chairman Clark of the Interstate Commerce Commission and Director Smith of the Geological Survey.

Chairman Clark put the entire Interstate Commerce Commission on record as unqualifiedly in favor of immediate legislation providing for seasonal freight rates on coal and he appeared in favor of the engineers' bill. His testimony was mainly directed against the objections of the Lake dock operators, who the week before presented strong objections to any measure that does not provide reductions on lake coal moving to Lake Erie ports. Mr. Clark does not believe that Illinois coal will make any large inroads on the market territory of the dock men in the Northwest as a result of seasonal rates.

He pointed out that no new measure can be undertaken or progress made that does not in the beginning tread on the toes of some people. There is so much competition in the coal industry that any change that affects delivered prices will certainly meet with disfavor on some side. He made the interesting statement that two years will be required for equipment builders to make up the war losses and current obsolescence in open-top cars, if the building program is not speeded up.

Iowa coal operators are very much opposed to the seasonal rate, George Heaps of the Iowa Coal Operators' Association told the Frelinghuysen committee on April 28. He expressed the opinion that the low summer rates would give practically all of the coal business in Iowa to Illinois. This would necessitate the closing of the Iowa mines in the summer, he declared.

Iowa Operators Will Suffer No Loss

On account of the poor roof and soft bottom Iowa mines must be kept going, Mr. Heaps testified. To close them during the summer virtually would mean that the Iowa industry, which already has a hard time to keep its head above water, would be killed, in the opinion of Iowa operators. It would be impossible, it was pointed out, to compete with Illinois in providing coal for storage since it has been demonstrated that Iowa coal, on account of its sulphur content, cannot be stored. Spontaneous combustion often results before the coal has been in the pile for a week.

Senator Frelinghuysen told Mr. Heaps that he was not at all convinced that seasonal rates would put the Iowa operators out of business, but he asked if it would not be justifiable in the interest of the general welfare, to close some of the mines producing inferior coals under great difficulties. Mr. Heaps explained that his testimony was intended only to point out just what would happen to the Iowa industry and he made no attempt to say what would be the best national policy.

George H. Cushing, the managing director of the American Wholesale Coal Association, concluded his testimony with the following recommendations:

That no attempt be made to regulate this complex situation by any statute.

That, seeing the need is more for men and leadership than for the passage of any new laws, the sub-committee on Interstate Commerce of the United States Senate undertake, during the summer and fall, to stimulate production, as it did in 1919, by gathering facts from producers, wholesalers and retailers and then by trying to get cars to move the coal, and to get the consumers in the backward districts to buy and store coal.

Line Haul and Interline Haul Cars To Be Grouped

That an effort be made to divide the coal cars of all originating roads into two groups—those allotted to the line haul and those allotted to the interline haul—to the end that each group of consumers may be independent of the bad practices of the other group.

Other points in favor of eliminating seasonal coal traffic made by Mr. Cushing were as follows:

First—One-third idle time at the mines doubles the necessary investment in mining property and results in a great financial loss to the nation.

Second—No business in summer and periods of boom in the fall result in giving the coal industry a highly speculative character, which always serves to invite into the industry the worst element in any business.

Third—Allowing mines to lie idle for one period, but always in expectation of being called upon to produce, serves to attach to the mines an unnecessarily large working force and to cause, due to the uncertainty of the working time, a dangerously large labor turn-over. Specifically, in the prewar period it subtracted annually sixty thousand workers from our total immigration to supply the demands of the mines. Today it is keeping tied to the mines fully one hundred thousand workers who should be released from the bituminous coal industry to other industries which need workers.

Mr. Cushing also advanced the idea that the stabilization of coal prices could result only in either universal bankruptcy for the coal mines—which would defeat the purpose of the reform—or universal prosperity for the coal business—which would also defeat the purpose of the reform by inviting an increasing flood of new producers into the field. In a word, the business cannot be stabilized unless and until there is control of the coal land itself in some such way as will make it possible for someone to say when and where new mines may be opened.

Director Smith Sums Up

Director Smith of the U. S. Geological Survey reviewed the facts upon which the proposed relief was predicated. The seasonal fluctuation in coal output comes from a seasonal fluctuation in demand. The consumer must be hitched on to the problem of giving the mines more orders for the spring and early summer

months and of relieving both mines and railroads of their extra heavy burden in the fall and winter months. In a normal year the country over this seasonal inequality of demand calls for 35 per cent to 60 per cent more coal being mined in November, the peak-load month, than in April, the usual month of greatest slump in mine operation.

In Eastern coal fields the difference is less than this average and in Western fields much worse. Uneven demand thus requires more mines and more miners, both working a 75 per cent year, and conditions of unequal seasonal demand are also bad for the railroads, especially when combined with crop movements and winter interference with traffic.

The legislation proposed seeks to induce summer buying of coal by freight reductions in the spring months and increases in the fall and winter months. What statistics are available indicate that the rate differentials proposed by the committee of mining engineers are timed to influence buying in what are now the months of lowest production, yet taking some of the Appalachian fields, provision might well be made for some adjustment by the Interstate Commerce Commission. In fact, the principle of the remedy seems correct, but discretion may be required in its application.

It must be admitted, moreover, that this legislation is not a cureall and may be expected to make conditions even worse locally, but on the whole the coal business will be helped and miners, operators, and consumers eventually benefited by surer supplies of cheaper coal. To allow present conditions to continue is to invite an industrial paralysis, which has been averted rather narrowly several times in the past few years.

Public Utilities Are Seasonal Consumers

Public utilities and factories use much less coal in the summer than they do in the cold winter months. Recent power statistics regarding public-utility power plants of the United States, having a total annual consumption of 35,000,000 net tons, show that the daily production of electricity by these plants depends quite markedly on the season of the year, the consumption of electricity during the spring and summer being quite strongly contrasted with that of the winter. The daily output of electricity from April to July is about 100,000,000 kw.-hr., whereas it reaches nearly 13,000,000 kw.-hr. in the month of January.

C. E. Lesher, editor of *Coal Age*, formerly in charge of mineral-fuel statistics of the Geological Survey, while agreeing that it was desirable to equalize coal production and distribution throughout the year, doubted whether seasonal rates alone would accomplish this purpose. Three things were needed to stablize the coal industry: even rate of production, price policy which would prevent fluctuations, and a steady and satisfactory labor supply. He instanced steel as a stabilized industry, evidenced by the fact that for years prices on steel rails have been even. The anthracite industry is more stablized than the bituminous because the former has been able to produce a summer as well as a winter demand.

The steel industry is stable because it is in large units—not caused by legislation—and can control the situation. Larger companies in the coal fields would benefit the industry, as small producers starting operations when prices are high tend to upset business in winter. Seasonal rates would benefit some fields and injure others. Some bituminous sections require no stimulus for summer production. Movement of bunker and tidewater coal is independent of rates being regulated by world prices. He thought seasonal rates would simply transfer car shortage and high prices from winter to summer in some Eastern fields.

Senator Frelinghuysen Warns Coal Operators

No harm can come to the coal trade or the operators if they will only co-operate in an effort to equalize distribution, and you are losing sight of the fact that coal prices are advancing instead of declining, and they are advancing at the present time because the operators and the railroads cannot supply the needs. That is all, and the public do not propose to stand it any longer. Something is going to be done and all the theories in the world will not cure the situation, and if it is not applied in a mild and ministerial way it will be applied in a drastic control by the Government, and it is arising very rapidly; and I think it is a very poor policy to furnish nothing but criticisms and not make some effort to do something constructive.

Industrial Leaders Make Move for Amendment of Tax Laws

WITH the endorsement of the American Petroleum Institute and the American Mining Congress, the National Industrial Conference, composed of thirty national and state manufacturers' organizations, called a national conference of business organizations in the Blackstone Hotel, Chicago, Friday, April 16, for the consideration of a plan for readjustment of the revenue laws, which as now existent have become burdensome and in a sense impossible of administration.

There were present 150 representatives of sixty organizations and the entire day was given to discussion of proposals to eliminate the excess profits tax, readjust the clauses based upon the high brackets of the surtax, simplify the general income provisions, establish a more workable and equitable scheme of direct tax through either a consumption or sales tax, etc. The coal industry was represented by Rush Butler, general counsel of the National Coal Association.

The National Industrial Conference as a research organization had worked out and presented for consideration certain proposed amendments to the present law based upon suggestions of Dr. Adams and Secretary Houston, but the conference voted to refer all resolutions to the Taxation Committee composed of five members of the National Industrial Conference and eleven members to be elected by the non-member organizations represented in the meeting.

A general committee which was named was authorized to meet in two weeks, consider the advisability of adding needed members and act upon amendments presented to the conference.

NEWS FROM THE CAPITOL

BY PAUL WOOTON

National Coal Association Will Resume Issuance of Price Reports

DURING 1919, from April until November, the National Coal Association published weekly summaries of prices of bituminous coal as reported in closed and past transactions. These reports were very valuable records of the level and course of current coal prices. They did not, however, give any information concerning the effect on price averages of considerable volumes of coal moving on long-term contracts.

During the present year it is planned to publish weekly averages based on weekly reports of the prices realized by the operators from total shipments each week, including both current sales and shipments on old orders and contracts, as called for by the new form of the Bureau of Coal Economics. Reports for the first few weeks in April have already been received from three associations in the Middle West fields, and several associations in the Eastern territory have begun to collect the information from the operators on the new form.

Index figures on coal prices derived from these weekly reports will be published by the National Coal Association as soon as a sufficient number of associations have furnished the information on the new form.

Will Investigate Super Power Project

WHILE only one-nalf of the amount of the estimate was carried in the Sundry Civil Appropriation Bill, just reported, for a survey of power production and distribution, the item is regarded as being of especial importance in that the committee recognizes, in this period of retrenchment, the need for such an investigation. The cut in the appropriation is not vital because the bill permits contributions from private concerns interested. There is a marked tendency on Capitol Hill to congratulate the Appropriations Committee in bringing out this bit of far-seeing, constructive legislation. It indicates that Congress is thoroughly interested, that this engineering investigation is a wise step in the effort to keep the United States equipped adequately fo its future industrial needs.

The need for such an investigation became all the clearer when during the past winter the peak of electrical output was 10 per cent higher than during the war period. As explained by George Otis Smith, director of the U. S. Geological Survey, which will be in charge of the work, the investigation will cover the possibilities of power production at the mouth of coal mines, linking with those the water powers that are available.

There are certain places with water power available in the East, but they cannot stand alone, Dr. Smith points out. "They must be hitched up with the steam plants," he says. "Some of those steam plants must be put in at tidewater and some up near the mines. We will study the power requirements of the different parts of the Washington-Boston industrial area with the idea of distributing the new sources of power supply in terms of the demands. Probably half of the coal that is used for power generation will be saved.

"The small plant oftentimes has only one-third or one-fourth of the efficiency of one of these big modern plants. Then, of course, there is the application of electricity to our railroads. The big consumption of coal in the East is by the railroads. By electrifying them one ton of coal can be made to haul a train twice as far as it can if used in a locomotive. In addition, railroads would be relieved of a back-crushing load. Coal is the poorest freight they have. It is the most burdensome."

President Nominates New Commerce Commissioners

HENRY JONES FORD, Professor of Politics at Princeton University, and James Duncan, of Quincy, Mass., a vice-president of the American Federation of Labor, have been nominated by President Wilson as members of the Interstate Commerce Commission. A third new member has been selected and his name will be sent to the Senate as soon as he consents to serve.

Mr. Ford was nominated to succeed Commissioner James S. Harlan, and his term would expire on Dec. 31, 1925, Mr. Harlan's term having ended on Dec. 31, 1918. Mr. Duncan was appointed to one of the two new positions on the Commission resulting from its enlargement to nine members by the Transportation act. His term would end on Dec. 31, 1924, and that of the member yet to be appointed expires on Dec. 31, 1923.

Prof. Ford is a graduate of Baltimore City College. He has been professor of politics at Princeton since 1908 and has written a number of books on political science and related subjects.

Mr. Duncan was born in Scotland, was educated at Aberdeen and for many years worked as a statue granite cutter. He was editor of the *Granite Cutters' Journal*, served successively as secretary and president of the Granite Cutters' International Association and was a member of the commission sent to Russia in 1917 by President Wilson.

Director of Bureau of Mines Resigns

VAN H. MANNING, director of the U. S. Bureau of Mines, at Washington, has resigned, effective June 30. He will become director of research of the newly organized American Petroleum Institute, composed of the leading petroleum producers of the country.

New Cargo-Coal Provisions Made at Hampton Roads

AS the Tidewater Exchange, Inc., will operate only at the ports of New York, Philadelphia and Baltimore, steps have been taken to provide for the proper handling of coal through Hampton Roads, at which point the volume of business is greater than at any two of the other ports mentioned. The plan whereby coal was borrowed and loaned as before the war has been restored on the Norfolk & Western Ry. That railroad has issued an embargo, which became effective on May 1, against all tidewater coal except such as is duly authorized by a numbered permit issued by E. S. Moore.

Application for the permit must show the name and tonnage of the vessel to be loaded, the date when its arrival at Lamberts Point is expected, the amount of the tonnage that will be shipped from the mines daily, the name of the mines shipping, as also the names of the consignees under which the coal will be shipped if the source of the coal is not already arranged.

Permits will not be issued where the volume of shipment from the mines will not provide for a reasonably prompt accumulation of the coal for cargo, for car equipment will be delayed if the shipment has to be made more than ten days in advance of the date of the expected arrival of the vessel. Clearly in such a case it will begin to cumber the port before coal shipped for another cargo or cargoes has been unloaded if a vessel should fail to arrive in time or if road, pier or yard capacity or other conditions will not admit of prompt handling. It is understood that the Norfolk & Western officials are negotiating with coal operators for a permanent arrangement.

At Sewalls Point the Virginian Railway will have no pool whatsoever, but will continue to handle tidewater coal. More or less borrowing and loaning will be sure to take place, but no arrangement has been made for absorption of demurrage.

The Chesapeake & Ohio Co. has announced the establishment of the Newport News Coal Exchange. The pooling of coal will be continued during May under railway management and expense. The exchange will be operated under the supervision of E. I. Ford.

Kentucky Managers Will Gather in Lexington on June 4 and 5

ADMIRABLE is the program that H. M. Ernst, the president, and C. W. Strickland, the secretary-treasurer, have prepared for the members of the Kentucky Mining Institute, which will meet in the State University at Lexington on June 4 and 5 and be addressed by the most interesting of speakers.

George Eshrick, Jr., fuel engineer of the International Coal Products Corporation of New York, will describe the carbocoal process in an article on "The Future for Bituminous Coal." The company has a plant at Irvington, N. J., and is constructing, at the instance of the Government, an extensive plant at Kiser, Va.

"The Present Economic Situation" will be discussed by Charles H. Chase, research expert, Council of National Defense, Washington, D. C. To George H. Cushing, who will be toastmaster at the banquet, has been entrusted the subject "History of the Coal Industry." There is but one Cushing in the coal trade, namely the managing director of the American Wholesale Coal Association, Washington, D. C.

Seeks to End Car Shortage

Chairman Clark of the Interstate Commerce Commission on May 1 requested R. H. Aishton, president of the American Railroad Association, and Guy M. Freer, executive secretary of the National Industrial Traffic League, to appoint committees from their respective organizations to meet as a joint committee to devise means of reducing car shortage and congestion.

Chairman Clark also addressed a notice to all carriers and shippers asserting that individual and concerted action was needed for prompt restoration of better operating conditions and that only the greatest efficiency in transportation could prevent widespread economic loss.

John Callahan, traffic secretary of the National Coal Association, Washington, D. C., will discuss "The New Transportation Act—The Cummins-Esch Bill." C. E. Lesher, editor *Coal Age*, will throw new light on "Wage Problems," while J. B. Hicks, assistant superintendent power and mechanical department, Consolidation Coal Co., Jenkins, Ky., will further amplify the article presented by General Manager Appleton of the Ironton Engine Co. at the midyear session of the institute. His address will be entitled "Practical Use of Storage-Battery Locomotives in Coal Mines."

Colonel Warren R. Roberts, who is chairman of the Committee on Standardization of Mining Equipment of the American Mining Congress, Chicago, Ill., will present the subject "Standardization of Mining Equipment," and the important problem of "The Rehabilitation of Industrial Cripples" will be presented by W. C. McMurtrie, the director of the Red Cross Institute for Crippled and Disabled Men, New York.

Another paper to be presented is that by Herbert M. Wilson, director department of inspection and safety of the Associated Companies, Pittsburgh, Pa., the subject being "The Practical Operation of Coal-Mine Compensation Insurance under the Kentucky Law."

The banquet in the evening of Friday, June 4, will be addressed by Henry Laviers of the Paintsville district; John G. Smyth, of the Elkhorn district; K. U. Meguire, of the Harlan district; Alex Bonnymen, of the Hazard district, T. E. Jenkins, of the western Kentucky district, and J. E. Butler, of the Stearns district, the subject for discussion being the effect of the labor report of the Bituminous Coal Commission on the respective fields represented. A first-aid contest will take place on June 5.

Denver to Hold Concurrently Four Mine Conventions and a Contest

AS IF to save editors from excessive dining—their wining troubles are already ended by the Volstead Act and by certain changes in the Constitution—the Rocky Mountain Institute, the Colorado Metal Mining Association and the local chapters of the American Mining Congress and the American Institute of Mining and Metallurgical Engineers will hold their conventions at Denver on Sept. 9, 10 and 11 at the same time as the International First-Aid and Mine-Rescue Contest is held.

The Labor Situation

Edited by
R. Dawson Hall

Anthracite Conference Moves to Washington, D. C.

Operators and Mine Workers Are Still at Capitol City Trying to Bridge the Gap Between Them—Operators Reported to Have Made Offer of From 12 to 15 Per Cent

AT LAST something is stirring in the scale sub-committee for the anthracite region. The operators have offered a rate of increase ranging between 12 and 15 per cent and the mine workers have rejected it. As a consequence the operators and mine workers have been called by the Secretary of Labor to Washington to confer with him and have accepted the invitation. The sub-committee is still in the Capitol City.

On April 27 the operators made their counter-proposal to the sub-committee. What this was is not known exactly, but it is understood that it lay between 12 and 15 per cent. The official statement issued at the conclusion of the session read:

"The operators' representatives on the sub-committee of anthracite operators and mine workers have presented to the mine workers' representatives a written answer to the demands of the miners which the mine workers' representatives have now under consideration and which will not be made public until after the meeting of the sub-committee tomorrow night. The committee will meet at 7 p.m. tomorrow."

The promise to the press was, however, not fulfilled and even today just what the anthracite operators offered is not known.

On the next day the offer of the operators was considered by the full wage-scale committee of the mine workers at their headquarters in the Continental Hotel and they decided to reject it. This action was reported to the sub-committee of operators and mine workers that evening (April 28) and after a session lasting four hours this statement was handed out:

"The sub-committee of miners and operators met tonight. The mine workers replied to the operators' proposals as to the increase in wages and in reference to arbitration and declined to accept them. Pending further meetings of the conference, statements of both parties are withheld. The committee will meet tomorrow at 12:30 p.m."

Later in the evening the resolution offered by the operators, which called for arbitration of the differences by a commission of three representatives of the general public to be appointed by President Wilson, was given to the press. It ran as follows:

"Whereas, under date of March 9, 1920, at a general conference of anthracite operators and anthracite mine workers the workers presented to the operators certain specific demands covering wages and working conditions in the anthracite industry upon the expiration of the contract of May 5, 1916, and at that general conference four representatives of each party were appointed a committee to take under consideration the demands presented by the mine workers and to negotiate a new contract, and whereas, during the session of the said committee the mine workers modified two of their demands, to wit: the demand covering wages and the demand covering hours per day and days per week, and whereas, the committee after several weeks of earnest effort has been unable to reach an agreement, and whereas, it is to the public interest that there be no cessation of work and that anthracite coal shall be supplied to the consumer without interruption,

"Therefore be it resolved: That the President of the United States be requested to appoint three men unaffiliated with any anthracite operation or with any labor organization and representatives of the public who shall sit as arbitrators with this committee and decide all questions at issue based on the demands before the conference, the decision of the arbitrators to be final and binding on the parties to this submission."

While no official statement came from the mine-workers officials it was understood that John L. Lewis, International President of the United Mine Workers, had been in telephonic communication during the week with Secretary of Labor Wilson and it was said that the latter had been kept informed of the progress being made by the sub-committee.

That nothing was accomplished at the session held on April 29 toward conciliating the differences between the operators and miners was made known at the conclusion of the session. The offical statement reads:

"In recognition of the request of the Secretary of Labor, Hon. W. B. Wilson, the sub-committee of anthracite operators and mine workers will hold its next meeting in Washington, D. C., on Saturday morning at the office of the Secretary of Labor."

Must Pay "Check-Off" or Be Idle

SOME trouble has been experienced of late in the coal fields of the Province of Alberta because of the government's ruling that only miners acquiescing in the "check-off" for payment of dues to the United Mine Workers of America shall be permitted to work. This order was issued last January, but at first was not strictly enforced by the operators. Recently, however, the Minister of Labor agreed to accept responsibility for the regulation. This brought about an effort at its enforcement, with the result that the miners left work at two camps at Coleman, Alta., and at Blairmore and Canmore in the same province.

Thus are workingmen compelled by the Government to take part in conspiracies against the public whether they are or are not willing.

Texas Tonnage Rate So High That Increase Is Forty Cents Per Ton

TENTATIVE agreements affecting the wages of coal miners in Texas, except as to the apportionment of pay to machine crews, were reached at a conference of representatives of the coal miners with coal operators at Fort Worth, Texas, last week. The question of pay for machine crews was left for a conference on May 3.

The changes on which agreement has been reached will be effective for two years and will include:

An advance to all day and monthly men of $1 a day, except trappers and boys receiving less than men's wages, who shall be advanced 53c. a day; an increase in pick-mining rates of 40c. a ton, and in yardage, deadwork and room-turning of 20 per cent. These advances are added to the scale in effect on Oct. 31, 1919, and to be effective from April 1, 1920.

Among the coal operators present were: Gomer Gower, Ed. Britton, Judge E. B. Richey, Mier C. Johnson, W. H. John, A. J. Clendennin and W. F. Nance. Representatives of the miners were: John P. White, Cleveland, Ohio, appointee of President Wilson on the Bituminous Coal Commission: John Wilkinson, Muskogee, Okla., president of the United Mine Workers of District 21, embracing Texas, Oklahoma and Arkansas; G. H. Sparling of Gordon, Texas, board member of the United Mine Workers; Ed. Autry, Mat Rossato, Ed. Tidwell, Lawrence Santi, Joe Vietti and O. James, all of Thurber, Texas.

All points in the two-year working agreement between the coal miners and operators of District 21, United Mine Workers of America, which comprises Oklahoma, Texas and Arkansas, have been settled in accord with the recent award of President Wilson's commission, and harmony rules between miners and operators.

Wage Scale Granted Mine Workers of Northern West Virginia

IN Monongalia, Marion, Harrison, Preston, Taylor, Barbour, Randolph, Upshur, Lewis, Gilmer, Braxton and Webster counties and in the portion of Nicholas county containing coal or coal mines being operated along the line of the Baltimore & Ohio R.R. a new wage scale was granted to the mine workers on April 20, which is to be effective until March 31, 1922. It has been accepted by fully empowered representatives of the United Mine Workers of America and by the scale committee members of the Northern West Virginia Coal Operators of America, who were given power by the several operators of that area to make an agreement.

The International Union, the district officers and those of the subdistricts in the counties and the half county named guarantee the "fulfillment of this agreement . . . both in letter and spirit. The memorandum declares:

"Free rent, free powder, free coal, free light or any extra compensation paid in time or money, or otherwise, is hereby mutually construed as a bonus and is condemned, and it will therefore be assumed in operation under this contract and for future joint conferences convened for scale-making purposes that all such bonuses or advances in excess of wages provided in this contract were paid because of physical conditions in or around mines where such methods are practiced and the bonuses and wages as paid in whatever form shall constitute a part of the basic rates for such mines.

"The mining rate for entries shall be applied to all headings not more than 12 ft. wide and not less than 8½ ft. wide and to all cross-cuts not more than 14 ft. wide."

OUTSIDE DAY LABOR RATES.

Occupation	Cents per Hour	Dollars per Day
Picking-table boys (where employed)	48¾	3.90
Substation operators and Fan tenders	50	4.00
Tipplemen, excluding Dumpers but including Car cleaners and Car handlers: Greasers, Blacksmith's helpers, Machinist's helpers (outside)	63¾	5.05
Firemen (hand firing)	66¾	5.35
Dumpers, Combination firemen, substation and fan men	67½	5.40
Car repairmen (helpers)	68½	5.48
Waters tenders	68¾	5.50
Blacksmiths (second class), Car repairmen, Machinists (second class), Engineers, Combination engineers and firemen	72½	5.80
Electric coal-hoist Engineers (shaft)	81¼	6.50
Machinists (first class)	85	6.80

INSIDE DAY-LABOR RATES.

Occupation	Dollars per Day Open Lights	Closed Lights
Trappers	3.53	3.61
Machinists helpers (inside) 65c hourly	5.20	5.20
Timbermen helpers, Wiremen helpers, Pumpers, Bratticemen helpers, Greasers	5.24	5.32
Cager's couplers	5.28	5.32
Cager's helpers	5.44	5.53
Trackmen helpers	5.56	5.64
Pipemen	5.68	5.76
Drivers, Gathering-locomotive helpers, Tripmen, Ordinary trackmen, Slatemen, Timbermen, Wiremen, Bratticemen	5.76	5.84
Motormen, all classes, Motormen helpers, Gathering-locomotive men, Main-line trackmen	5.86	5.94
Shotfirers, Cagers	5.92	6.00

RATES FOR MINING PER NET TON COAL FIVE FEET OR OVER.

Type of Work	Open Lights	Closed Lights
Pick Mining:		
Room and pillar	$0.8760	$0.890
Entries	0.9360	0.950
Electric Machine Work:		
Loading, hand drilling, in entries	0.6470	0.660
Cutting, without drilling, in entries	0.1690	0.175
Loading, hand drilling, in rooms	0.6270	0.640
Cutting, without drilling, in rooms	0.1523	0.155
Loading, machine drilling, in entries	0.6270	0.640
Cutting, electric chain-machine drilling, in entries	0.1790	0.185
Loading, machine drilling, in rooms	0.6070	0.620
Cutting, electric chain-machine drilling, in rooms	0.1623	0.165

RATES FOR MINING PER NET TON COAL UNDER FIVE FEET.

Type of Work	Open Lights	Closed Lights
Pick Work:		
Hand drilling, in room and pillar	$0.9500	$0.9640
Hand drilling, in entries	1.0650	1.0790
Loading, hand drilling, in entries	0.7575	
Cutting, hand drilling, in entries	0.1948	0.2008
Loading, hand drilling, in rooms	0.7000	0.7130
Cutting, hand drilling, in rooms	0.1583	0.1610
Loading, machine drilling, in entries	0.7375	0.7500
Cutting, machine drilling, in entries	0.2048	0.2108
Loading, machine drilling, in rooms	0.6800	0.6930
Cutting, machine drilling, in rooms	0.1683	0.1710

Mine-Run Base and Pay for Slate Cause Break in Eastern Ohio

AFTER being in session three days at Wheeling, W. Va., the joint conference between about forty operators representing all sections of eastern Ohio and the official of sub-district No. 5, United Mine Workers of America, adjourned on Wednesday, April 21, without any agreement being reached.

Because of the inability of the miners and operators to agree on the forty-one different points of contention it was decided to appoint a special scale committee of ten operators and ten miners to consider the various demands presented, that committee beginning its sessions on Thursday, April 22. The two most important demands of the miners were: Payment for all coal on mine-run basis, and payment for all stone moved.

Kansas Industrial Relations Court Held Constitutional in District Tribunal

Judge Curran Declares Divine Right to Strike Is Like the Divine Right of Kings, as Dangerous as It Is Untrue and That the Court to Limit It Was Formed in Lawful Exercise of Legislative Authority

JUDGE ANDREW J. CURRAN declared the new Kansas Court of Industrial Relations to be constitutional in a decision announced in the Crawford County District Court, April 30.

Judge Curran then granted a temporary injunction forbidding Alexander Howat and other district and local union officials of the Kansas district of the United Mine Workers from calling a strike.

The decision was rendered on a demurrer offered by the defense to the application of the State. He quoted legal authority from Blackstone to Chief Justice White in support of the broad police power of the State.

"I am not concerned with the wisdom of the Legislature in passing this law," Judge Curran said. "Whether the law is economically wise or unwise is not for the court to say. The one question to be considered by me is whether the law is in conflict with the Bill of Rights, the Constitution of the United States or with the Constitution of the State of Kansas."

Judge Curran said he did not believe that the Fourteenth Federal Amendment curtails the police power of the State or that the State has ever surrendered any part of that power to safeguard the health, morals and general welfare of its citizens.

He declared that the State was paralyzed by the mining strike last December; that cities were dark, schools were closed, the sick and afflicted in institutions threatened with freezing, and the means of moving food interfered with.

"If the State should stand by and not correct such conditions it would be a reproach to organized government and to civilization," the Judge asserted.

"The conditions that prevailed last December give an idea of the purposes and intent of the Legislature in enacting this law, and of the object sought by our State through this legislation.

Right to Work As Sacred As Right to Quit

"A great deal has been said of the divine right to strike and the divine right to quit work," Judge Curran said. "In stressing the divine right to strike, the divine right to work, the right of the man to have employment so he can provide for his wife and children has been sadly overlooked. The divine right to strike, where it affects the health and welfare of the public, must be relegated to the realm where the divine right of kings has been sent."

As the workers in the Kansas mines are now largely at work, Judge Curran did not make the injunction mandatory, as the State had asked. He said that he would make the injunction mandatory if a showing were made during the life of the injunction that the mines were idle. The temporary injunction will be in effect until May 12, when the application of the State to make it permanent is set for hearing.

As already stated, when the district leaders of the United Mine Workers of America were summoned to appear before the Court of Industrial Relations of Kansas, which is comprised of George H. Wark, a lawyer, Clyde M. Reed, a newspaper publisher, and Mr. Huggins, by whom the law for the establishment of the court was framed, they refused to appear and were committed to jail. Whereupon the mine workers of Kansas went on strike to force the hands of the court by which their leaders were committed.

Judge Curran, of the Crawford County district court, on April 15, overruled a motion for a retrial, which was asked by Alexander Howat, Thomas Harvey, August Dorchy and R. B. Foster. Phil H. Callery, the attorney for the arrested men, questioned whether to appeal the matter to the Supreme Court, seek a release of the men under a habeas corpus action or give bail. The last consideration won, but meanwhile the attorneys for the prosecution prepared for a new move.

They made, late on April 16, a motion to amend the injunction suit so that the petition would require "the defendants, who are members of the district board of the United Mine Workers of America of District 14, to issue an order legally and properly signed and to publish the same in accordance with the rules and practice of said labor union, directing all members and workers to return to work in said mines and to continue to perform labor therein in the manner reasonably necessary to enable the owners to continue the normal productions during the pendency of such litigation."

Despite the protests of the counsel for the mine workers, who argued that the hearing in this new phase in the case could just as well be left till April 27, when the whole matter was to be heard, the court made its decision on the following day, April 17, ordering Alexander Howat and other officials of the Kansas district union to instruct the mine workers to go back to work, informing them in his decision that if they did not heed his instructions they must be prepared to show cause on April 27.

At that time all the mines in the state, except one shaft and three steam-shovel pits, were idle. In fact, it is estimated that 11,700 mine workers were "taking a vacation."

Much of the friction was removed, however, that same day, for bonds were presented to Judge Curran for the union officials and were accepted by him, orders being given by the court that the men be released from prison. A. B. Kellar, county attorney, immediately notified the sheriffs at Ottawa and Iola that they should not only release the men but offer them transportation to Pittsburg, Kan.

The district officers sent out orders, on April 19, requiring the men to go back to work. Some did, but thirty mines did not. In the Franklin region all the mines remained closed. Mines in other regions also remained idle, but volunteered the explanation that they were on strike because the price of explosives was too high and not because they desired to make trouble for the Court of Industrial Relations and for Judge Curran.

Discussion by Readers

Edited by
James T. Beard

Proper Methods of Erecting Trolley-Wire Guards in Mines

Referring to the inquiry, *Coal Age*, Mar. 11, p. 506, as to the requirement, in compensation-insurance regulations specifying a width of 5 in. between the guard-boards protecting a trolley wire, in a mine, permit me to say that my experience is that the boards or guards protecting the trolley wire should be wide enough apart for the trolley-wheel and harp to have ample room when the wheel happens to jump the wire.

The reply to this inquiry said that reducing the width between the boards will give less opportunity for the trolley to jump the wire. My experience is that there is more danger in having the boards too close together, than when they are spaced further apart. The narrow space within the boards is more liable to cause an accident to the trolley.

In practice, I have seen a trolley jump the wire just as it was entering the guard-boards, with the result that the boards were torn out by the trolley-wheel and its harp striking the ends of the boards and failing to enter the narrow space between them. In another instance I witnessed, the harp was pulled off the trolley-pole, and the pole broken, because the space was too narrow.

Therefore, I prefer spacing the boards a sufficient distance apart to leave ample room for the trolley between the boards and the wire. In my opinion, this very much reduces the chance of an accident.

Oak Hill, W. Va. WILLIAM DICKINSON, SR.

An Unpractical Mine-Rescue Searchlight

Kindly allow me the privilege of referring to the brief article that appeared in *Coal Age*, in the department Ideas and Suggestions, March 4, p. 429, describing what appears to be a home-made contrivance that the designer claims to believe would provide an effective searchlight to be carried into a mine by a rescue party. The statement is made that "ordinary safety lamps or the small electric flashlights are or may be inadequate for the purpose intended."

The proposed device or apparatus, as illustrated, consists of a half-dozen drycells or batteries connected in series with an automobile spotlight. The cells are set in a rough wooden box to the end of which the spotlight is attached. A bail is attached as a handle for carrying the box. It is stated that this device will furnish "a portable light of high power that can be safely used in a gasey or dust-filled atmosphere."

No one will deny that the most important work of a rescue party when entering a mine after a disaster is to take every precaution to avoid further danger or injury to themselves or to those who may have survived and are still alive in the mine. No one who would suggest carrying such a device as this into an atmosphere supposed to be explosive and dangerous could be accused of applying even the first principles of "safety first."

Exploring a mine after an explosion is not only hazardous work but requires strenuous exertion where the explorers must crawl over high falls, squeeze through timbers and drag themselves through narrow holes, all of which calls for the most simple and reliable equipment possible both to light their way and enable them to breathe a supply of pure air when surrounded by poisonous gases that may also be explosive.

WHY THE DEVICE SHOULD BE CONDEMNED

One can easily imagine what would happen to this collection of drycells contained in a bulky wooden box, which would with the greatest difficulty be carried through entries filled with débris and fallen timber. A loose wire or connection and a spark across the gap would cause the ignition of gas and a second explosion that would kill the rescuers and any possible survivors of the first disaster.

It is to be hoped that there are no mine owners or superintendents living who are so far behind present mining practice as to fail to provide apparatus that is essential to safety when the work of rescue must be performed, following a disaster in the mine. Such equipment includes not only the necessary breathing appartus to permit the rescuers to enter and work in a poisonous atmosphere, but modern electric mine lamps that have been tested and approved by the Bureau of Mines for such work.

Surely, no one familiar with conditions following a mine disaster will hesitate, for a moment, to condemn such a sucidal apparatus as illustrated and described in the short article to which I have referred. The description of such a device in a standard publication like *Coal Age* is sufficient, in itself, to cause some men to try it without considering its dangerous possibilities. I want to ask, would not a censorship be justified?

Victoria, B. C., Canada. JAMES DIXON.

Avoidable Degradation of Coal

Letter No. 4—In order that the operator may obtain the largest possible percentage of lump coal, with the least admixture of dirt and slack, both in the anthracite and the bituminous districts, he must make every effort to plan out his scheme of mining to that end.

The mine must be equipped with modern appliances for the transportation, handling, conveying, cleaning, washing and preparation of the coal. In the equipment of the mine, the chief aim of the operator is to secure the largest possible yield of high-priced marketable coal, from the product loaded into the car by the miner. Bearing this in mind let us study briefly some of the conditions affecting these desired results.

We will start with a solid face of coal in the mine chamber. The coal may have laminated seams of slate

or bone interstratified with the coal. In some cases, the slate is thick enough and so situated in relation to the coal that its separation therefrom is easily made. At other times, the refuse is in thin slabs that adhere to the coal and which are difficult of separation. Still again, there is a solid face of clean coal.

As the coal lies in its bed, there is 100 per cent of lump coal. The physical conditions just mentioned, and the skill of the miner coupled with his desire to produce a car of coal of the highest value are the chief factors that determine the maximum yield of lump and other marketable sizes of the coal. But, while it is true that the physical conditions existing in the seam cannot be changed, it is possible to so plan the mining of the coal as to take advantage of the peculiarities present.

Considerations That Must Be Taken Into Account When Laying Out a Mine

Efforts in this direction must begin with the laying out of the mine; determining the proper direction of driving the entries and rooms; deciding the correct width of pillar and opening; and adopting a suitable method of extracting the coal, at the working face. All of these bear directly on the ease with which the coal is broken down and the percentage of coal that can be recovered in a marketable condition from the pillars, which must be of sufficient size to prevent the coal from being crushed by excessive roof pressure, before it can be properly mined.

In my experience, it is possible to teach the miner to use more judgment and skill in the performance of his work. This can be done by employing mining instructors for that purpose. Better results, however, are obtained by employing high-class assistant foremen, each of whom should have charge over a limited number of men. Instances have come under my observation where good results have been obtained through instructing the miner in the proper use of explosives, topping their cars and shooting the coal. Not only is the coal mined in better shape, but the labor of breaking up the lumps and loading them into the cars is made much easier where the work is performed according to the instructions given.

It is quite evident that the majority of miners do not exercise their best efforts in the production of a clean car of lump coal. This is not from lack of skill, but from a want of desire on their part. In other words, like the most of mankind, the miner gets away with all he can, not realizing that his neglect injures his own interests as it does those of his employer.

Effect of the Contract System in Mining

I cannot agree with William Wesnedge, *Coal Age*, Feb. 26, p. 416, that the contract system is so largely responsible for the loading of inferior coal. It is true that the contract system puts a premium on *quantity* rather than on *quality* of production. However, we have found, in Pennsylvania, that it is practically impossible to get a day's work from a miner in cases where he is paid by the day.

In some sections of Alberta, and possibly the same may be true in British Columbia, the day-wage system has proven not only popular but productive of good results. In my opinion, this situation is covered very well by the present system of testing cars for refuse, and docking the miner for loading slate and bone with his coal or where his car is not up to the standard. This system, however, has its weak points and by no means solves the problem.

In my opinion, a policy of co-operation on the part of the management, combined with some profit-sharing scheme, would go a long way toward affording a practical solution. Such a scheme would eliminate many other difficulties besides, in the mining game. It appears to me that the hearty co-operation of employers with their men, and a well-thought-out scheme of profit sharing are the determining factors in securing desired results.

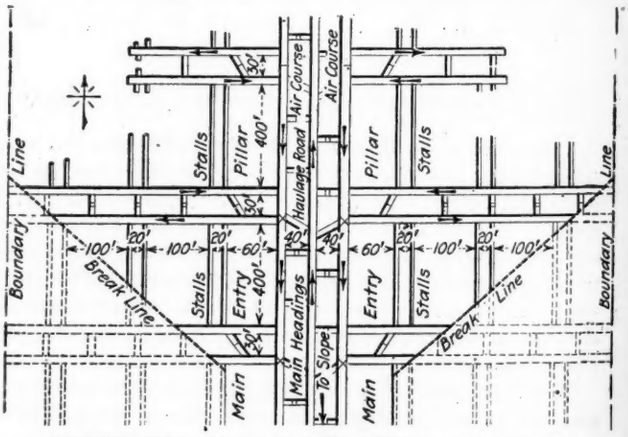
The amount of money involved in the payment of bonuses would be well invested. Some individual coal companies have worked out a scheme of bonuses by contract system, while others have tried to accomplish the same results by encouraging competition between sectional foremen in charge of different sections of the mine. However, this scheme has not been given as fair a trial in the mines as in some manufacturing establishments. I am confident if the right man—one who was trusted and had the confidence of his men—started such a scheme, the result would be encouraging.

Scranton, Pa. Mine Superintendent.

Working Kanawha River Coal

Letter No. 5—Referring to the problem presented in the inquiry of Arthur L. Sheldon, *Coal Age*, Feb. 26, p. 419, regarding the extraction of the coal from three overlying seams in the Kanawha River District, permit me to commend the good judgment shown by Mr. Sheldon in desiring to secure the practical views of others regarding the best method to adopt in the working of that coal. It is with pleasure that I offer the following suggestions, hoping that they may be of some benefit to him and assist the solution of his problems.

For the ventilation of the subsequent workings, I would sink a shaft that would penetrate all three of



MINING THE COAL ON THE RETREATING PLAN

the seams. This shaft would be used solely for ventilation, and the coal would be taken out through a slope as I have indicated in the sketch submitted herewith. The mine should be opened by sinking a slope having a grade of about 25 per cent. The slope should be started from a point convenient for loading and shipping the coal, say somewhere between the railroad and the base of the mountain. It should be driven in the direction of the hills and away from the river. Not knowing the points of the compass in this Cedar Grove locality, I will call the direction of driving the slope

north, and assume that the river runs east and west, which will enable me to more clearly explain my method of working.

Assuming that the slope and its air-course have been driven to the lower seam, starting at the top. main headings should be driven, three abreast in each seam, thus dividing the mine into two sections or sides, in each seam or lift. As these main headings are advanced, cross- or butt-headings are driven to the right and left. These are driven two abreast on 400-ft. centers. Again, as the butt-headings are advanced, -10 ft. stalls are driven north and south off the butts. The stalls are driven in pairs with 20-ft. pillars between them, and leaving 100 ft. of solid coal between each pair of stalls. As the stalls from consecutive pairs of butts are driven up they hole into each other. Cross-cuts are driven in the 20-ft. pillars, on 40-ft. centers, which provides for the good ventilation of the stalls.

Extraction of the Coal Is Started at the Boundary on the Retreating Plan

When the stalls have been completed in the first and second butt-headings, the work of drawing back the 100-ft. and the 20-ft. pillars of coal, between these headings, is started by cutting across the 100 ft. pillars separating the several pairs of stalls. These pillars are worked out on the retreating plan, the extraction being started at the extreme east and west ends of the butts. Starting at the north end of a 100-ft. pillar, it is possible to work 4 or 5 men, and to stand from 8 to 10 cars on that face.

This plan of working possesses a positive advantage over the room-and-pillar method of working. The motor is able to pull out a trip of 8 or 10 cars from this face in almost the same time that it would take to pull a single car from the face of a room. Such being the case, it will be readily seen that from six to seven times more coal can be put out by this method than is possible in the room-and-pillar plan of working.

In respect to the system of haulage on the main slope, I very much prefer rope haulage to any conveyor system. A good rope haulage in a slope is better, in my opinion, than hoisting the coal in a shaft. I do not approve of dumping coal in the mine and, for that reason, would not use either skips or conveyors as was suggested by Mr. Sheldon, in his inquiry.

Connecting the Slope with the Main Haulage Road In Each Seam

In order to make sure of a good connection where the slope passes through each seam, I would start a sufficient distance back on the slope and widen out so as to provide sufficient clearance for a second track leading into the seam. The work should be secured by a concrete arch over the haulage slope and further supported by a concrete base for the sidetrack leading to the seam. This arrangement would enable me to pull coal from any one of the three seams, by means of the haulage rope in the main slope.

Regarding the order of working these seams, it is my experience that the work, in each overlying seam, should be kept about 200 ft. in advance of that in the seam next below. This plan should be followed, until the extraction is complete up to the main barrier pillars protecting the main slope and air-courses. The extraction of the coal in the barrier pillars and the slope pillars should not be undertaken until the last, and when these pillars have been drawn back, the mine will be abandoned. In my opinion, the plan I have suggested will insure a greater daily tonnage than what is mentioned in the inquiry as being desired. I believe this method is not as expensive a one to install and equip, as would be a shaft, or a skip-hoist. C. W. Atkins.

Switchback, W. Va.

Present-Day Industrial Democracy Compared with That of Former Times

Many interesting articles have appeared in *Coal Age*, on Industrial Democracy, Co-operation, Co-ordination and kindred themes relatng to the mining industry; but I consider that the editor has given what is by far the most graphic illustration of them all in his Foreword, in the issue of February 26, which to my mind explains clearly the present-day situation that confronts all classes. I fear that the article was passed over by many who may have failed to grasp the true thought expressed. If so, I hope such will turn back and read the article for the good of their fellowmen.

We need not go back many years to recall the pleasant understandings that existed between the bosses and the workmen and the extreme cordiality that was manifest between all classes. As the editor states "the workmen discussed matters with the Boss" and many questions concerning the work itself were handled by the workers. It is needless to mention that workmen were trusted by their bosses and vice versa. A knowing confidence existed between the men that engendered that spirit of reliance on each other and naturally their problems were readily handled. But today, that confidence is somewhat wanting. Work is placed before the men with definite plans for each little detail, and originality and individual instinct is left out. Plainly, it is all mechanical. We truly need some of the old time-honored co-operation.

Contrasting the Present with Former Times

A few years ago, a boss when making his rounds would invariably talk over the problems of the day with his men, and his meaning was more clearly understood than is possible in the rush of today. In those days, the boss did not have so much "red tape" to carry around in his pockets and to overtax his brain. He was care-free, in many respects, and able to follow his work more closely—a man of the hour and always on the job. While the present-day boss must keep busy and be ever on the job, yet his accomplishments do not seem to be as great as in the old time. The reason is, I believe, because he has too many "straight-line" methods to follow and is not given enough freedom. I do not wish to be misunderstood, as I am speaking from a practical standpoint and for the good of all concerned.

The "mutual understanding" referred to by the editor, which existed in the olden days was undeniably the rock upon which success was founded. There was plenty of work and everybody was busy. The work was accomplished with more ease than seems possible today and there was less grumbling. Patience was a manifest element. The boss listened attentively to community and industrial matters alike, giving his opinion whenever asked and for the best interests of all. He was always clearly understood, as he talked in a language familiar to the men.

Again, I remember the days when the bosses would get together and talk over their problems with the general boss. At these meetings, he could show a boss what his haulage, pumping, tipple or other work was

costing, and compare the same with previous work. He would help to figure out a possible way in any difficulty. The general boss, on his part, would ask for opinions and weigh them carefully. Thus they compared every-day problems and worked out a method for all to adopt; or, at least, give to each a general idea, leaving the details to be worked out to suit the different conditions.

This plan increased the efficiency at the different mines, and a particular scheme was not adopted for all the mines, regardless of conditions, as is so general at present.

It is too true that many orders given today do not suit the conditions in a particular mine. The order, no doubt, has been successfully adopted at one mine; but that does not mean it will be equally successful at another. To thus force an impractical plan onto the shoulders of men who know by experience a better way will naturally cause dissatisfaction. To have this occur often only increases the resentment on the part of all concerned, which retards production in the mine. Then, what happens? Simply, the management wants to know why! The man gets a notice, "Please explain," and he is fortunate if he can do so with satisfaction.

Friendliness in Mine Management

I am a firm believer in friendliness and personality, as suggested by the editor. I pity a man without a friend and, to have friends, one must be a friend himself. To my mind, discipline should be founded upon friendliness, at least to a great extent, as discipline will surely fail of actual worth, unless friendliness is upheld. What man will listen to discipline and be satisfied, in body and mind, unless a friendly attitude is also extended. Therefore, I do not feel that friendliness undermines discipline, but I do know that discipline will undermine friendliness, if it is not properly used. To such an extent will this be true that the industrial activity of a mine or plant will be materially lessened; and unless friendliness is engendered there will ever be a charge on the hands of the employers.

But the old personal touch with the old friendly characters will do more to take up the lost motion that now exists, than any method I know. Industries seem to be built around too much "young blood," who have too many new and "castle" ideas. Some of the old stock should be added to this young blood to hold them down. Not the old ways of doing things at the mines, but the new and efficient methods, with the old tried-and-true Industrial Democracy, as it is termed today. "Ben."

W. Va.

Shifting the Worker

Letter No. 6—The incident cited in the inquiry signed "A. H." *Coal Age*, Feb. 12, p. 327, makes me wonder that a superintendent could treat a fellow workman with such contempt and with so little consideration for the man's well being. I hope that this type of superintendent is in the great minority.

In my opinion, it would have paid that mine official far better if he had taken a few moments to look over the circumstances and had regarded the matter from an unselfish standpoint. A man must put himself in the other fellow's place before he can appreciate his position. Had this superintendent done so, he would not have lost a good man, who had probably performed faithful service but who was compelled to move by reason of the treatment accorded him.

Having filled every kind of position about the mine, both above and underground, my experience compels me to think that "A. H." did not receive fair treatment. He would probably have been glad to have continued his duties at the substation, until the superintendent could find a man for the place. In my judgment, the language used by the man's superior was uncalled for and showed bad taste on the latter's part.

There is little wonder that there is so much unrest among mine workers at the present time, when they receive so little consideration in the struggle to better their condition. A superintendent who will treat his men in the manner described can never hope to get from them anything better than eye service.

It may be that the superintendent in question was born with a silver spoon in his mouth; but, unless that is the case, he could hardly look back on his own career without recalling a time when some one gave him an opportunity for stepping higher, such as he refused to the man in his employ.

It would be well for ourselves and those we employ if we could, periodically, take account of stock in ourselves, so to speak, consider our manner of dealing with our men and its results. There would be better feeling all around and, at the same time, better service would be given. It goes without saying that treatment such as this man received can never do otherwise than breed dissatisfaction among workers.

Experience of an Efficient Track Boss

Speaking of ill treatment of men, I recall an experience that was my own some 27 years ago. At that time, being in charge of the tracks on the main haulage road in a mine, I drew the mine forman's attention, one day, to a bad section of roof over a switch, and asked him to have the place timbered, at night, as it was impossible to do the work in the day when the mine was running. The foreman neglected to do this, however, and I was not surprised when coming out of the mine, a few days later, and approaching the place, I was suddenly halted by a heavy roof fall, while the man a little ahead of me narrowly escaped being killed.

Finding the mine supetrintendent and foreman at the bottom, I reported the circumstance to the former, only to be told that I was to blame in the matter. I informed the superintendent that I had reported the bad condition of the roof to the foreman a few days previous. In reply, I was told to study the mining law, a thing with which I was already familiar, having studied it carefully, in preparation for examination.

My surprise can easily be imagined when, the next day, I was instructed to call at the office where the payclerk gave me my money and told me I was "fired." He could give no reason for the act. However, as the result proved, it was the best thing that could have happened to me. Like "A. H.," I found a better place, with another company, where I received good treatment and a year later was made superintendent at the mine, which adjoined the one where I formerly worked.

In the course of time, I accidentally met the superintendent who succeeded the one who fired me. In the course of the conversation that followed our meeting, he told me the reason I was fired was that I knew too much to suit the former superintendent, who blamed me for reporting things to the mine inspector, because that official found much in the mine that needed attention.

————, Pa. Fairplay.

Inquiries of General Interest

Answered by

James T. Beard

Contract System of Mining Coal

We are desirous of obtaining some information regarding the contract system, which we understand is in use in some Pennsylvania mines. Can *Coal Age* or any of its readers explain who has supervision over the work, and what is the basis of settlement. Is the coal mined paid for on a tonnage or a yardage basis? How large a portion or section of the mine is let out on contract, and who furnishes the mules or other means of haulage, and supplies the timber, trackage, etc.?

Akron, Ohio. MINE SUPERINTENDENT.

This question was submitted to a practical mining man who has had much experience in that class of work, and the following reply was received:

Prior to the advent of the United Mine Workers organization, in the anthracite coal fields, some of the coal companies made a practice of letting a contract to a miner to mine the coal in certain sections of the mine, or in a certain number of working places. For example, a miner would take a contract for mining the coal in all the places on a certain gangway. He hired his own miners and laborers, and in a few instances employed the drivers, car-runners and door-tenders working in his own section or gangway.

The contract system of mining proved very satisfactory and developed a high efficiency, per man. I wish to emphasize what may seem a peculiar fact; namely: greater results are obtained, per man, where the work is in charge of a contractor, or the mine is worked by a small individual operator, as compared with a large corporation. This fact was clearly proved by the results of the contract system where the work was closely supervised by the man most deeply interested.

The advantage peculiar to the contract system is that the contractor is in a better position to control all matters affecting the cost of production. In this respect, he has the advantage of the most capable mine foreman, whose authority is largely handicapped by his superiors in office, and who cannot, therefore, exercise the same control over the many details that affect the cost-sheet. On the other hand, the contractor can arrange the work and move his men from place to place as conditions may require. He is also able to secure a greater recovery of coal and protect his men from danger to a greater extent than would be possible if he were acting as foreman of the mine.

The contract system, however, is not without its objectionable features. A large contractor frequently becomes prosperous and exercises an overbearing manner toward his men, thereby breeding a jealous contempt among them. The contractor is also generally favored by the company in their distribution of cars. In a slack time, the contract miner will be given steadier work and have fewer idle days than the company miner, which increases his earning capacity.

This manifest favoritism of the company toward the contract miner, aroused much opposition when the miners' union became fairly well established in the region; and the result was that at the termination of an agreement between the miners and operators, the demand was made by the union that no miner be permitted to work more than one place or employ more than two laborers. This grievance has been repeatedly presented to the Board of Conciliation, and it is my impression that the decision has finally been reached that all miners are entitled to an equal distribution of cars. The fixed award of the Anthracite Coal Strike Commission reads as follows:

> That mine cars shall be distributed among miners, who are at work, as uniformly and as equitably as possible; and that there shall be no concerted effort on the part of the miners or mine workers of any colliery or collieries, to limit the output of the mines, or to detract from the quality of the work performed; unless such limitation of output be in conformity to an agreement between an operator or operators and an organization representing a majority of said miners in his or their employ.

At the present time, the mine foreman has general charge of all persons employed in the anthracite mines of Pennsylvania. The individual miner is considered a "contractor." He cuts and loads the coal for which he is paid on a stipulated basis, per car, or per yard, as the case may be. In the comparatively flat fields of the Lackawanna and Wyoming Valleys, the miner is paid by the car and he, in turn, pays his laborer one-third of the price for loading. In fairly big good coal, six or seven cars, containing from 80 to 100 cu.ft. is generally considered a shift.

Recently, the laborer has taken advantage of the miner and has insisted on the payment of a full shift for each day that he goes into the mine, regardless of the number of cars loaded. This has naturally worked a hardship on the miner who is frequently obliged to load his own coal, and the physical condition of many of the older miners is not equal to the task. It will be readily seen that miners working in the thinner seams can better afford to meet this condition and pay the laborer a full shift, because if he fails to get cars he can arrange to take up bottom or blow down his roof, as the case may be.

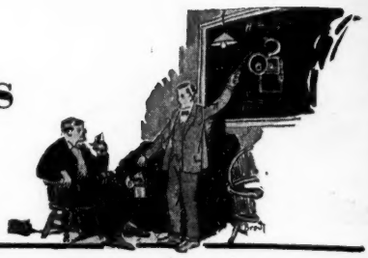
In the Lower Valley, the coal lies at a much greater angle or pitch and is generally mined by the yard and loaded from chutes by company loaders. The miners usually work as partners and divide their earnings on a 50:50 basis. The gangway miners, in this field, also drive the airways or what are known as "chutes" and "headings." This is essential to the safety and efficiency of the operation. Both in the upper and lower fields, the miner is paid for lifting bottom, blasting down roof standing timber and building brattice.

The work is supervised by the mine foreman and his assistants, each assistant being given a certain section, the size of which depends on conditions. Each miner furnishes his own supplies of powder, oil and tools, for himself and his laborer. All other material is furnished by the company. Under favorable conditions in these valleys, the chamber or breasts are driven on 60-ft. centers and opened to a width of 30 feet.

Examination Questions

Answered by

James T. Beard



Mine Inspectors' Examination, Held at Pottsville, Pa., March 30, 31, 1920

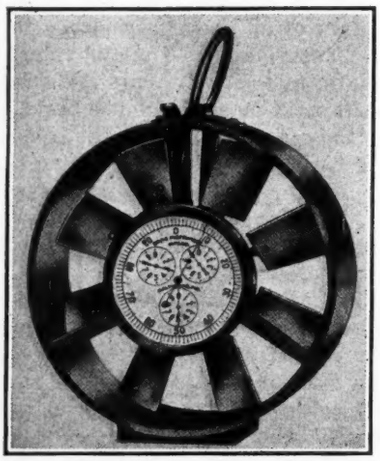
(Selected Questions.)

Ques.—Explain what is meant by the capacity of an air compressor.

Ans.—The capacity of an air compressor is expressed by the quantity of free air it can deliver each minute, and is equal to the piston displacement, in cubic feet per minute. This is the theoretical capacity of the compressor and is approximated but never actually attained by any compressor in operation.

Ques.—Describe the anemometer and state its use in relation to mine ventilation.

Ans.—The usual form of the Biram anemometer is shown in the accompanying figure. It consists of the revolving vane having its blades inclined to the plane of revolution. The inclination of the blades is such that an air current, moving with a velocity of one foot a minute, will produce one revolution of the vane in that time. In other words, a single revolution of the vane corresponds to one foot of air travel. The vane is connected, through a series of gears, to a recording dial that indicates the number of revolutions of the vane. The instrument is used to ascertain the velocity of the air current in an airway in a mine. The number of revolutions shown by the reading of the dial divided by the number of minutes the instrument is exposed to the current gives the velocity of the air in feet per minute. The measurement of velocity by the anemometer is merely approximate, but it is much used in mining practice.



THE BIRAM ANEMOMETER

Ques.—Describe a rescue apparatus with which you are familiar.

Ans.—Without referring to any particular type of breathing apparatus, all of which involve the same principles of construction, it may be said in reply to this question that the principal features of breathing apparatus are an oxygen cylinder equipped with a reducing valve by which the high pressure to which the oxygen is compressed (120 atmospheres) is reduced to a normal pressure for breathing. A breathing bag with inhaling and exhaling divisions is connected by tubes with a mouthpiece or helmet worn by the operator. A mouthpiece and nose clip are generally preferred to the helmet, as the latter is too bulky for use in the mine. The apparatus contains a regenerator holding caustic soda, which absorbs the carbon dioxide from the exhaled air, making the air again respirable. In use the breathing bag is first filled with pure air. As this air is inhaled by the effort of breathing and again exhaled, it passes into the exhalation side of the breathing bag, where it comes in contact with the caustic soda, which removes the carbon dioxide from the air. The air, slightly depleted of its oxygen, then passes into the inhaling division, where it is mixed with fresh oxygen from the oxygen cylinder. The oxygen is delivered at the rate of two liters per minute, which is the estimated supply needful to restore the air, which has lost some of its oxygen through absorbtion by the blood in the act of breathing.

Other parts of the apparatus are a pressure gage for indicating the quantity of oxygen remaining in the cylinder, an emergency bypass and valve that provides for the filling of the breathing bag with oxygen, in case the reducing valve fails; a saliva trap to prevent the saliva from the mouth entering the breathing bag; an inspiratory and expiratory valve for regulating the flow of the air to and from the breathing bag to suit the requirements of the wearer.

Ques.—A volume of 200,000 cu.ft. of air enters a mine at a temperature of 40 deg. F.; what is the volume at the outlet, the temperature being 70 deg. F.?

Ans.—Assuming there is no increase of volume due to the presence of mine gases in the return, and ignoring the effect of the decrease of ventilating pressure in the return airway, the volume of air passing varies directly as the absolute temperature. In other words, the volume ratio is equal to the absolute-temperature ratio. Therefore, calling the required volume of air in the return airway x we have

$$\frac{x}{200{,}000} = \frac{460 + 70}{460 + 40} = \frac{530}{500}$$

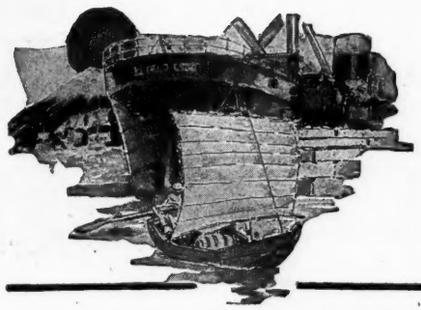
$$x = \frac{200{,}000 \times 530}{500} = 212{,}000 \text{ cu. ft.}$$

Ques.—If 10,000 cu.ft. of air passes per minute through an airway 12 ft. in diameter, how many cubic feet per minute will pass through an airway 6 ft. in diameter, the length and pressure being the same in both cases?

Ans.—For circular airways of equal length, the quantity of air circulated by the same pressure is directly proportional to the square root of the fifth power of the diameter. In other words, the quantity ratio is equal to the square root of the fifth power of the diameter ratio. Therefore, in this case, calling the required quantity of air x, we have

$$\frac{x}{10{,}000} = \sqrt{\left(\frac{6}{12}\right)^5} = \sqrt{\left(\frac{1}{2}\right)^5} = \frac{1}{\sqrt{2^5}} = \frac{1}{\sqrt{32}}$$

$$x = \frac{10{,}000}{\sqrt{32}} = \frac{10{,}000}{5.657} \quad 1{,}757 \text{ cu.ft. per minute.}$$



Foreign Markets and Export News

Bulgaria's Coal Resources Are in Need of Development

Only One of the Country's Mining Regions Has Been Extensively Developed, Twenty-three Miles From Sofia—Greater Part of the Coal Produced Is a Fair Quality of Soft Brown Lignite

As the production of coal in Bulgaria is insufficient for the needs of the country, Consul Graham H. Kemper, Sofia, reports, under normal conditions coal must be imported. Coal mining has not reached an advanced stage, nor is the coal produced of a very high grade. The conditions under which it is mined are such that the average output per man is very low, now approximately one-third of a ton per day.

Only one of the numerous coal-mining regions in Bulgaria has been extensively developed, the Pernik region, lying about twenty-three miles southwest of Sofia. The mines there are owned by the State and supply the greater part of the coal mined in Bulgaria. The productive area of these mines is said to be about twenty-three square miles. The State mine Bobov-Dol, situated about fifteen miles south of the Pernik mines, is the second in importance. The region covers a greater area than the Pernik region, but its productive area is smaller.

Other deposits, not yet extensively developed, are found in the Balkan Mountains between the towns of Gabrovo on the north and Sliven on the south; in the region north of the Maritza River, not far from Stara-Zagora; and in the territory around the Black Sea port of Burgas. Some of the mines in these regions are owned by the State; other mines and concessions are privately owned.

The greater part of the coal produced in Bulgaria is a fair quality of soft, brown lignite. Black coal, however, is found in the Stara Plaina or Balkan Mountain region.

The following table shows the annual production of coal in Bulgaria during the years 1911-1919 (metric ton = 2,204.6 pounds):

	Lignite, Metric Tons	Black Coal, Metric Tons
1911	260,540	8,064
1912	306,488	7,055
1913	347,525	10,220
1914	408,620	12,551
1915	515,263	18,502
1916	623,681	16,132
1917	742,221	19,052
1918	646,602	26,272
1919a	550,000	20,000

a Estimated.

No coal was imported into Bulgaria during 1918 and 1919, and very little since 1914. The quantity and value of coal and coke imported each year from 1911 to 1917, inclusive, was as follows:

	Coal		Coke	
Year	Metric Tons	Value	Metric Tons	Value
1911	184,070	$953,704	4,930	$37,320
1912	153,284	878,331	4,448	36,003
1913	106,951	835,970	1,003	10,625
1914	213,109	1,403,954	5,460	42,943
1915	375	3,474	.....	.....
1916	360	.....	.....	.....
1917	54,207	966,480	1,902	47,821

The greater part of the coal imported before the war came from England and Turkey. The English coal entered at Varna, Bourgas, and Dedeagatch, and the Turkish coal at Varna and Bourgas. The imported coal was consumed almost entirely in the eastern part of the country. The western part, including the capital, Sofia, used only Bulgarian coal mined in that region. The English coal, being far superior to Bulgarian or Turkey coal, was reserved almost exclusively for the railroads. A very small quantity of Serbian coal (from the Vrushka Tohouka mines) was imported at certain ports on the Danube for local use.

No coke is produced in Bulgaria, but it was formerly imported from England, Germany, Austria and Belgium. Before the war is was purchased for 60 leva ($11.58) per ton. The present price is said to be prohibitive. There is coal in Bulgaria from which coke could be produced, but the manufacture of coke has not been undertaken.

No coal is exported from Bulgaria. The demand has always exceeded the domestic supply, and at the present time there is a serious shortage.

While at present the high cost of coal, together with the fall in the exchange value of Bulgarian currency, prevents the importation of foreign coal, it is believed that in a short time the demands for more coal must be filled if the country is to continue the industrial development of the years prior to the war. It is not believed that such a demand can be satisfied by the coal mines of Bulgaria.

A congressional committee which recently visited the Virgin Islands declared that facilities for bunkering American vessels at St. Thomas are superior to those at Barbados and recommends that American vessels be bunkered and fueled at St. Thomas.

Oil Engines Favored by Swedish Shipbuilders

About 75 per cent of the steamers now under construction in England, it is stated, will be equipped for both oil and coal fuel. In this connection it is of interest to note that 70 per cent of all ships now building in Sweden will be equipped with Diesel motor engines. The opinion in Sweden is that the oil engine is decidedly superior to the combined oil and coal burners, and this opinion is supported by the testimony of the large Swedish shipping companies that have used the Diesel-motor ships for many years.

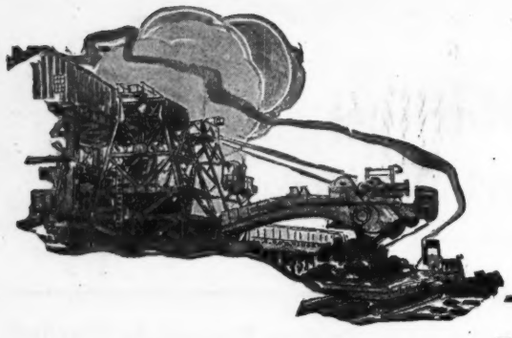
As the Diesel-engine steamer seems to be the prevailing type in the Swedish mercantile marine, several of the largest shipyards have changed their equipment in order to be prepared to build the new type exclusively. The largest shipyard in the country, Gotaverken A/B, at Goteborg, has enlarged and altered its docks and workshops with a view to using the new type, and other large yards are expected to follow this example.

At present there are being constructed at Gotaverken four Diesel-engine steamers of a combined tonnage of 37,000 and one steamer of 7,500 tons. At Lindholmen A/B, Goteborg, there are now being built three ships of the combined oil and coal-burning type with a total tonnage of 24,000; at Kockums A/B, Malmo, a Diesel-engine ship of 8,000 tons is under way; and at the shipyard of the Oscarshamn Shipbuilding Co. there are in an advanced state of construction four ships for oil burning.

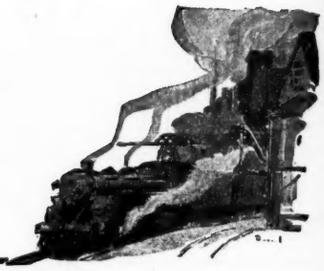
Japanese Coal Production Increases 10 Per Cent

According to Commerce Reports of the Department of Commerce, in spite of pessimistic reports made from time to time of the gradual exhaustion of the mines, *Shipping* and *Engineering* note with interest that the output of coal in Japan during the first eleven months of 1919 was put at 25,825,000 tons, showing an increase of 2,740,000 tons, or about 10 per cent, as compared with the corresponding period of the previous year.

The larger output is attributed to the revival of old mines and the increase in the number of new mines, owing to the profitable prices obtaining, although the output in Kyushu, which constitutes approximately 60 per cent of the total production, did not materially change.



Production and the Market



Weekly Review

Production Gains with Better Car Supply and Some Relief Is Experienced in the West and Middle West—Conditions Still Acute in the East—Export Movement Gains —Lake Situation Worries Shippers—Anthracite Advances Reported.

BETTER movement of loads and empties is the general reason for the upward trend in production reported by the Geological Survey for last week. Consumers everywhere complain, however, that cars are not being received, and reports of plants forced to close or curtail operations for lack of fuel continue to come in.

As the railroads slowly work off the accumulations in yards with such limited labor supply as they can muster some coal is getting through. At the mines the lack of empties is almost as serious now as it was two weeks ago, but every day shows a little improvement and a production in excess of 9,000,000 tons is estimated for the last week of April.

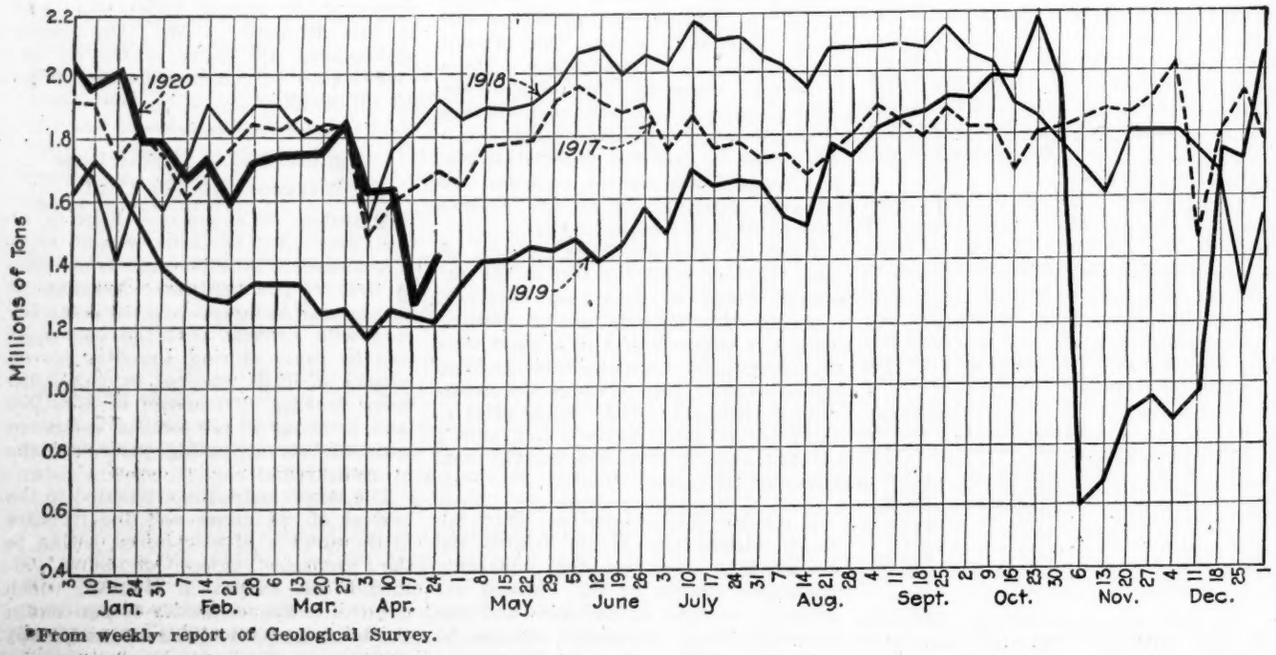
Export movement continues heavy with demand in excess of the supply. The passing of the Federal Tidewater Coal Exchange is expected to expedite movement by removing all restrictions. Western embargoes on the Chesapeake & Ohio and the Norfolk & Western last week forced a heavy movement to Hampton Roads, so much as to seriously congest the port. New high levels in smokeless prices are reported from the roads, $11 at terminal being reported in one instance. Boston reports heavy clearances for New England from this port with prices gaining over previous levels.

Improvement in railroad conditions is reported from such Western centers as St. Louis, Columbus and Cleveland, but with the supply still limited as it is, prices are high and going up. From Pittsburgh comes the word that both buyers and shippers are discounting the return to less troubled times and that buying is light with a break in prices expected in a short time.

Assigned cars are in use and the roads have found it necessary to confiscate less coal for their own uses as a result. Complaint is made that mines with assigned cars are getting the labor away from the commercial shippers and that cars in excess of ability to load are being left at railroad fuel mines to the serious detriment of the other operations.

Anthracite is in an uncertain period. While waiting for the wage decision some companies have advanced prices as much as a dollar a ton. Deliveries have been delayed by strikes and cold weather has kept demand strong.

Average Daily Production of Bituminous Coal*



*From weekly report of Geological Survey.

Reports From the Market Centers

New England

BOSTON

Traffic Conditions Improve Slightly—Railroads Continue Seizures—Assigned Cars Expected to Cause Complications—Prices Strong—Heavy Clearances at Hampton Roads—New High Levels on Smokeless—Anthracite Advance Foreshadowed.

Bituminous—Traffic conditions show a slight improvement from week to week. The Boston & Maine has somewhat increased the number of cars taken daily from connecting lines, and the flow of west-bound empties is greater. The Boston & Albany and the Maine Central have about resumed normal service, although the latter is largely dependent upon the Boston & Maine. The New Haven road is still unable to function in any adequate degree, having maintained an embargo against anthracite for about four months.

Commercial coal is being taken freely for railroad requirements. Commercial and other consumers' coal, which was shipped at Government fixed price, has been confiscated by the railroads and must now be replaced to the consumers at an extra cost of something over $2 per ton. The railroads may either have to replace the coal taken, or pay the going price in the current market for coal yet to be shipped. It is understood that one New England road, alone, has confiscated 200,000 tons within a short period.

Assigned cars will not solve the problem of railroad fuel. Certain mines will have cars; others will not, and labor will be certain to take umbrage. Consumers who bought their supplies early, at lower prices, may find that assigned cars are carrying off the entire output of individual mines.

Car-supply, generally, is reported to be better, especially in central Pennsylvania, and contract shipments may soon begin to increase. For several days the all-rail requirements may suffer somewhat, because of the great dearth of bunker and other steam coal in New York Harbor.

All quotations on steam and gas grades are quite firm. Despatch at Hampton Roads is practically normal. The volume of coal is sufficient now to keep the terminals up to capacity, and there is no lack of bottoms to load. New England clearances are still small compared with the tonnage that came here two years ago, but this territory is fast disappearing from all calculations of shippers from the smokeless fields.

High rates by water have led consumers here to turn to all-rail channels, and the average buyer favors getting coal from central Pennsylvania all-rail.

Prices on Pocahontas and New River, especially for bunker purposes and to piece out cargoes, have gone soaring recently—$9 f.o.b. vessel. Large and wealthy concerns are offering the most extravagant inducements, and a few operators are yielding. Except among the most conservative the contract figure of $4 per net ton has been entirely lost sight of.

At this end the smokeless coals are easily commanding $12 and more on the cars at Providence, Boston or Portland, and a much increased tonnage might be absorbed as spot fuel at remunerative figures.

Quotations at wholesale, for spot shipment, range about as follows:

	Cambrias and Somersets	Clearfields
F.o.b. mines, net tons	$4.50@5.25	$4.15@5.00
F.o.b. Philadelphia, gross tons	7.25@8.10	6.55@7.45
F.o.b New York, gross tons	7.60@8.45	6.90@7.80

Anthracite—Definite signs of the company program have now appeared. An announcement has been made by one company of the advancement of circular prices of $1 per ton on broken, egg, and stove; 90c. on chestnut, and about 75c. on pea. This probably foreshadows similar action on the part of other companies and may mean $7.35 for broken and egg, $7.70 for stove and chestnut, and $6.00 for pea, all f.o.b. mines per gross ton.

Retail distributors continue to be most apprehensive. Shipments are extremely slow in every direction. Both by water routes and all-rail receipts are quite light.

Tidewater

NEW YORK

Anthracite Prices Advanced by Large Company—Some Piers Resume Loading—Unsettled Labor Conditions at Mines and at Tide—Demand Heavy With All Coal Supplies Short—Bituminous Quotations Show Slight Changes.

Anthracite—Without waiting for the operators and miners to end their wage conferences, at least one of the large operating companies advanced mine prices for domestic coal $1 per ton beginning May 1. It would not be surprising to the trade in general if similar increases would be made shortly by the remaining companies.

The court order dissolving the Reading Company has caused some prominent members of the trade to predict a free-for-all market, the quotations fluctuating similar to every other commodity when the subsidiary companies of the Reading are segregated.

Conditions in this market show a slight improvement. Loading at the piers has been resumed in part, due to the partial ending of the railroad strike and an improvement in transportation problems. Shipments from the lower ports are not as prompt as from the upper ones, due to a continuance of the harbor labor difficulties. None of the piers is on a normal basis.

Production has shown gradual improvement, the miners expecting shortly to know the result of the wage conference. But with the members of the subcommittee deadlocked and the Federal authorities appealed to, conditions are not so favorable for continuance of work at the mines.

There is much dissatisfaction at the delay in reaching a wage agreement and the union leaders are having some difficulty in keeping the mines open.

Local conditions are serious. Retail yards are running low of supplies and dealers are cutting down deliveries to one- or two-ton lots. Dealers report a heavy booking of orders for next winter's fuel. Buckwheat is in heavy demand. Because of weather conditions, most of the big office buildings are using almost normal quantities. Rice and barley are in good demand but, as in the case of buckwheat, the stocks are short. Current quotations for company coal per gross ton at mine and f.o.b. tidewater, at the lower ports are as follows:

Broken, mine $5.95; egg, $6.35@$7.35, tidewater $8.20@$9.20; stove, mine $6.60@$7.60, tidewater $8.45@$9.45; chestnut, mine $6.70@$7.70, tidewater $8.55@$9.55; pea, mine $5.30, tidewater $7.05; buckwheat, mine $3.40@$3.75, tidewater $5.15@$5.50; rice, mine $2.75@$3.25, tidewater $4.50@$5; barley, mine $2.25@$2.50, tidewater $4@$4.25; boiler fuel, mine $2.50, tidewater $4.25.

Quotations for domestic coals at the upper ports are generally 5c. higher on account of the difference in freight rates.

Bituminous—The local market shows considerable strength so far as demand goes, but there is much delay in shipments. Deliveries are as important as prices, and some dealers are said to pay an extra price if assured the coal will be shipped promptly.

Coal is coming here in better shape, but nothing like normal. The various piers are loading better but harbor difficulties make towing difficult, and there were rumors of additional trouble. Lack of fuel has caused many factories here to discontinue operation, throwing many employees out of work.

Uneasiness continues in the mining fields because of slack work, chiefly on account of the shortage of cars. A continuance of these conditions may drive many of the mine employees into other fields of activity. The railroads continue to confiscate large quantities of

fuel and the consignor is put to much trouble to replace it.

Towing is a big factor in the price of coal. These charges continue to range from 50c. to $1 a ton and some individuals report higher quotations.

With the Government controlled Tidewater Coal Exchange out of existence, handlers of coal for export look for added strength to that market. It is not expected that the issuance of export licenses will be continued by another branch of the Federal Government.

Quotations showed slight changes from last week, many shippers withholding prices because it was impossible to promise prompt deliveries. Producers of Shawmut were quoting around $4.75, with Pool 11 being quoted at about $5.25. Pool 10 was held by some shippers at from $5.50 to $5.75, the latter being the top price. Quotations for loaded boats ranged from $10 to $12, with an occasional higher figure demanded.

PHILADELPHIA

Anthracite Domestic Increases $1 a Ton at Mines—Some Steam Sizes Go Up, Others Down—Retail Prices Increase and Delivery Heavy — Bituminous Scarce with Demand Strong—Spot $6 at Mines.

Anthracite—For the first time probably within the past twenty-five years, the individual shippers set the pace as to the price of coal to be shipped during the month of May. One prominent independent announced a flat price of $9.75 for egg, stove and nut, with $7 for pea, f.o.b. mine. Shortly afterward the largest independent shipper announced the following prices: Egg, $7.55; stove, $7.85; nut, $7.95, and pea, $5.80, at mines. Next one of the largest companies quoted $7.35 for broken and egg, $7.70 for stove and nut, and $6 for pea, practically an increase of $1 per gross ton in the mines prices. Finally most of the independent houses gave out figures approximately 75c. higher than the last named.

The steam coals have been quoted as follows: Buckwheat, $4; rice, $3; boiler fuel, $2.25, and barley, $1.25—an increase of 25c. for buckwheat, a decrease of 25c. for boiler and of $1 for barley. The last size has been a drug on the market.

The change-of-size proposition seems to have been entirely lost sight of in the turmoil of price fixing. The dealer has passed the increase on to the consumer, adding something to cover the increase of capital needed in business, together with gradually increasing delivery costs.

All city yards have fairly large stocks, but they are quickly cleaned up, and the dealers are beginning to ask for more coal, expecting nothing but moderate shipments for some weeks. There is the possibility of the miners stopping work.

The steam trade is extremely active, especially on buckwheat and rice, reflecting the shortage of bituminous coal in this market.

Bituminous—There is quite a strong demand for bituminous throughout this district. The iron industry is in urgent need of fuel. The great need is for gas coal, with a car supply running from 13 to 35 per cent. Contract customers receive 40 per cent of the amount called for, with utility plants doing a little better on steam coals.

In the spot market gas coals are offered around $5.75 to $5.85, f.o.b. mines, for Fairmont mine-run, with Pennsylvania gas coals at about the same quotation. Quotations on Pennsylvania steam coals from pools 10 and 11 are from $5.50 to $6. However, some consumers needing coal frankly said they could not pay anything like these prices and continue in business.

Some of the larger manufacturers are going direct to the mines and bidding for the coal, resulting in increasing the spot figures.

The railroads are willing to pay about $3.25 at mines for Pennsylvania coal and $3 for the Fairmont grades for their own use. Producers mostly insist that such prices are simply impossible and are less than cost of production, although some shippers feel that they might thus be able to get cars and make up the difference by having a greater tonnage for the spot market. The roads are not getting enough fuel in this manner and confiscation is far from unusual.

In regard to another strike of the railroad men, the various brotherhoods have been holding conferences ever since the last outbreak, and the spirit of unrest is far from quieted; many crews are idle in this territory on account of a continuance of strike conditions at New York tide piers.

BALTIMORE

Spot Market Moves Upward with Reserves Light — Embargoes and Coal Trimmers' Strike Features in Connection with Heavy Export Movement—Hard Coal Demand Dead as Trade Awaits Schedules.

Bituminous—In the face of a lessening urgent demand on the part of consumers, due to the belief that a break in the present exceptionally high market is sure to come, the operating and sales end of the coal industry continue firm in their demands. During the past week the spot market moved upward, and it is now almost impossible to get any quantity of Pools 9 and 71 coal without paying around $6 f.o.b. mines.

Good coals are readily sold all the way from $5.25 to $5.75 at the mines, and run-of-mine Fairmont gas coals, with a differential of 25c. a ton against them, have sold here the past week as high as $5.25. It is now rare to hear of $5 spot coals, f.o.b. mines, and probably nothing is being sold below that figure.

Both consumers and sellers are generally holding back from contracting. There is a disposition to take no chance of losing any rise that may come. The new tidewater pool arrangement has gone into effect here without complication.

But an embargo has been put on some of the pools that are crowded, and a coal trimmers' strike has slowed up loading, so that a general embargo may be necessary for a time at Curtis Bay. The reserve at Curtis Bay is now around 1,800 cars per day or about 40 per cent of normal. The loadings here in April have been quite heavy for export coal, and the total for the month, of coal placed aboard foreign-bound coal cargo carriers, will run around 400,000 tons.

Anthracite—The hard coal situation still awaits the action of the miners and operators and the establishment of a wholesale schedule thereafter. The dealers here do not take orders except on a basis for price at time of delivery. Many will only deliver for immediate domestic use and will not put coal in for storage. Some few dealers are selling the coal they receive at 50c. above schedule rates, but most of the coal merchants here are sticking strictly to schedule.

Lake

BUFFALO

Bituminous Coal Moving Slowly—Pittsburgh District Still Tied Up by Strikes —Canada Stocked Up But New Freight Arrangement Unpopular — Anthracite Situation Much Improved.

Bituminous—The situation here is not much improved; the Pittsburgh district still being tied up by switchmen's strikes. The slow coal movement is not all due to a car shortage; the railroads are doing what they can to increase the supply, but they can make but little headway. Notices of shipment are quite irregular, so that dealers do not know whether to push sales or not.

At the same time the demand is not large. Consumers expect prices to drop as soon as the strikes are out of the way and some shippers agree with them. For this reason consumers are not buying any more than for present needs. Canada seems to be pretty well stocked up, and now, with a new order out requiring absolute prepayment of all freight on coal to Canada, some new arrangement has to be made. Some shippers do not plan to pay freight on contract coal sold at mine prices, but others say that the shipper cannot escape these payments. It is a great burden on them.

Buffalo harbor is about as badly tied up as it well could be. Practically all the men concerned are on strike and refuse to sign up for the opening of the season. No coal is coming in and the fleet cannot sail except on fuel left over last fall.

The price of bituminous is little changed and the consumer pays it un-

willingly. Allegheny Valley mine-run has been marked up to $6 to $6.35, with Youghiogheny gas $6.75; Pittsburgh and No. 8 lump and three-quarter, $6.25 to $6.50; mine-run and slack, $6 to $6.25; Pennsylvania smithing and smokeless, $6.50 to $6.75, all per net ton, f.o.b. Buffalo.

Anthracite—The situation is much improved from last week. One of the leading companies is delivering coal at such a good rate for several days that the complaint of scarcity has about disappeared. At the same time the demand keeps up, for everybody wants to get winter coal at present prices. If the shippers have the coal it goes out freely. The fear of further difficulty at the mines is not so great as it was.

The loading of water coal is as yet confined to one company, which now has about 50,000 tons afloat. With no fuel, no rate and no crews, in some cases, the future does not look very rosy.

Much more anthracite has been burned in the city this spring than usual on account of the shortage of natural gas. Many people, who restored the gas service, had to put in coal again, as the gas went out.

Coke—Coke consumers are not buying any more than they must of local shippers, it being apparent that the current prices are much higher than their contracts. The supply has been badly reduced by car shortage and other difficulties, so that it was often necessary to get coke wherever it was to be found. Shippers were not always able to get any sort of a supply, so that prices are as high as ever, with low grades about out of the market. Quotations are as follows: $12 for 72-hr. foundry, $10.50 for 48-hr. furnace, and $7 for domestic sizes, to which must be added $2.60 freight for the net-ton, f.o.b. prices here.

CLEVELAND

One-third Normal Coal Supply Moving into Cleveland—Prices Continue Firm—Lake Trade Quite Small and Outlook Poor.

Bituminous—Though more striking switchmen are reported to have returned, the improvement in the railroad situation is confined to newspaper reports. Coal is moving into Cleveland in sold trainloads, to the extent of 35 to 40 per cent of normal supply. Plant activity is slightly better, though all are operating on a coal supply of a day or two. Operators fear any perceptible relief in car supply is 45 to 60 days distant. Steam-coal users continue ready to take easily twice the tonnage that operators could supply under normal conditions. Average stocking facilities in Cleveland are not over a 30-day supply, and it is feared it will take half the summer for most steam-coal users to stock up.

No more sizable contracting is reported, as operators are unwilling to commit themselves further until conditions become more normal. The contract market seems to be $3.75, f.o.b. mine, for No. 8 slack and mine-run and $4, f.o.b. mine, for lump. Retail dealers are paying from $4.25 to $4.50 f.o.b. mine, for spot supplies of No. 8 and No. 6 steam coal.

Anthracite and Pocahontas.—The usual spring dullness grips both grades, and sales are light, though not abnormally so for the season. Prices remain unchanged.

Lake trade—The close of April finds the Lake trade a good million tons behind last year to this date. May's beginning is most inauspicious, as the movement to the Lake front is light. Unless summer and fall shipments break all records, the 1920 movement will be far under the 30,000,000 tons planned.

Lake shippers fear the Frelinghuysen bills, providing seasonal freight rates on coal, will divert cars from the Lake trade. It is announced that Lake bunker coal from lighters will cost $6 a ton, and at Sandwich and Line island docks, $7. Fifty-five cents to Lake Michigan ports other than Milwaukee, with 60c. to Milwaukee, are the freight rates named in a recent large contract.

Prices of coal per net ton delivered in Cleveland by retail dealers are:

Anthracite—Egg and grate, $12.20@12.40; chestnut, $12.50@12.70; and stove, $12.50.

Pocahontas—Shoveled lump, $10.50; and mine-run, $9.25.

Domestic Bituminous—West Virginia splint, $8.75; No. 8 Pittsburgh, $7.75; Millfield lump, $8.50; and cannel lump, $11.00.

Steam Coal—No. 6 and No. 8 slack, and No. 6 and No. 8 mine-run, $7.75; and No. 8 3-in. lump, $8.00.

MILWAUKEE

Soft Coal Famine Imperils Industries—Coal Dealers Call a Halt and Restrict Deliveries—No Relief Expected Until Receipts by Lake Improve.

The last week in April finds the Milwaukee coal market in a chaotic condition, due to a shortage of soft coal and inability of dealers to obtain new supplies. The Milwaukee-Western Fuel Co., which handles 50 per cent of the coal received at Milwaukee, makes public an announcement that it has exhausted every effort to secure coal, and that after April 30 it will not be able to supply soft coal to consumers until the embargoes at the eastern and western coal fields are lifted.

Deliveries will be limited to water works and other public utility food-product plants, hospitals and homes. No coal will be allowed to go to non-essential industries. The switchmen's strike and the refusal of eastern railroads to accept coal, prevents supplies from reaching Lake ports from the mines. Lake shipping is at a standstill in consequence.

Householders are able to secure hard coal, owing to the fact that a cargo of 9,500 tons was received April 16. A cargo of 7,500 tons of soft coal was also received. These two cargoes represent the April Lake business thus far. A general advance in coal prices is slated for May.

Inland West

COLUMBUS

Better Transportation Aids Production—Good Demand for All Grades—Manufacturing Handicapped by Fuel Scarcity — Mine Output One-third Normal

The best feature of the coal trade in Ohio is the return to work of a large number of strikers; this aids the train movement and the car supply at the mines is growing better. As a consequence the output is better in all of the mining sections of the state. While embargoes are still in force, a fair tonnage is being shipped and some sections are being relieved of a fuel shortage, but conditions are far from normal.

Demand for steam sizes is probably the strongest feature of the trade. Many factories are still on half time or closed down entirely and reserves are fast disappearing. However, general manufacturing is going on in a way. Public service concerns are now being supplied and the same is true of most public institutions. Railroads are taking a larger tonnage as their freight movement increases.

The domestic demand is also strong and dealers are quite short of supplies, small lots only being delivered. Coal purchased often cannot be delivered; should it arrive it cannot be set on the switch for unloading, and trucks are used to relieve the situation.

Retail prices are firm. Hocking lump sells at $7.50 and mine-run at $7.25, delivered. Pomeroy lump and mine-run are about 25c. higher. Pocahontas is scarce and new stocks are arriving. West Virginia splints (prepared sizes) retail for about $8.50.

Production is now about 30 per cent of normal in most of the Ohio districts. In eastern Ohio the output is quite low because of strike conditions at junction points. The Hocking Valley and Pomeroy Bend districts are producing about 35 per cent of normal. A small amount of coal is being loaded for Lake shipment with producers loath to enter into agreements under present conditions.

Prices at the mines, of coal used in Columbus territory, are as follows:

Hocking lump	$3.75	@	$ 4.00
Hocking mine-run	3.50	@	3.75
Hocking screenings	3.25	@	3.50
Pomeroy lump	4.00	@	4.25
Pomeroy mine-run	3.75	@	4.00
Pomeroy screenings	3.50	@	3.75
West Virginia splints, lump	4.50	@	4.75
West Virginia splints, mine-run	4.25	@	4.50
West Virginia splints, screenings	4.00	@	4.25
Pocahontas lump	6.00		
Pocahontas mine-run	5.50		
Pocahontas screenings	5.25		

CINCINNATI

River Shipments Prevent Serious Shortage—Railroad Strike Clearing Up—Demand Strong and Prices Firm.

The "outlaw" switchmen's strike is being felt by the coal interests here. The production in the fields in West Virginia and Kentucky, which supply most of the coal to this market, has been comparatively large, but the car supply has been quite short, consequently in many quarters the pinch is being felt severely.

The Ohio River has again stood by in the hour of need, Cincinnati being spared a serious shortage through the medium of this waterway, great quantities of coal coming down at times when they were most needed.

The strike of yardmen on the Chesapeake & Ohio at Russel, Ky., is clearing up, and all that is required to approach normal on that line is for conditions to better themselves in other places, so that empties might be returned. Little coal has come down from West Virginia by rail in the past week because of washouts.

The demand for coal is strong here and prices are firm, but it is extremely difficult to gage prices at the present time. Local retailers are supplying their customers' immediate demands, but industrial firms have difficulty in getting a supply ahead.

ST. LOUIS

Slight Improvement in Railroad Conditions—Shortage of Steam and Domestic Coal—Country Districts Suffer—Situation in Various Mining Fields.

The local situation, although there is an acute shortage of steam coal, is showing a little improvement. A few switching crews have gone to work. At times a trainload of 15 to 20 cars will come in to one of the yards of the larger dealers, but the small ones are gettting no coal. A few steam plants get a car now and then.

More than half of the present requirements of St. Louis, outside of the storage supply, is coming in via trucks and wagons from East St. Louis. The domestic demand is easy on account of the weather.

In the country, however, both steam and domestic are short, and many plants are on the verge of shutting down. In the southwest the conditions are somewhat easier than at points that must be reached through the terminals in the larger places.

In the Carterville field cars are furnished a couple of days a week on the Missouri Pacific and Illinois Central railroads to mines that load railroad coal and a little domestic fuel. The Chicago & Eastern Illinois is tied up tight. The Burlington is doing better than the rest, with about three or four days a week.

In the Mt. Olive and Standard fields, the mines get one or two days a week, mostly railroad coal; little of it moving into East St. Louis.

In the Carterville and Mt. Olive fields the operators are maintaining their regular circular prices, but in the Standard field operators ask $3.25 for screenings, $3.50 for mine-run, and all they can get for domestic sizes.

There is nothing to indicate that conditions will be any easier. Coal in St. Louis is retailing (any kind obtainable) for from $7 to $8. No anthracite coal is moving in and no smokeless, and nothing from Arkansas. The coke supply is about exhausted.

DETROIT

Coal Traffic Manager Appointed—Federal Authorities Expedite Shipments to Gas and Electric Companies — Lake Trade Crippled.

Bituminous—Efforts to get coal into Detroit and Michigan, before the gas and electric companies of the state are compelled to close down for lack of fuel, appear to be making some headway. Following a conference in Lansing, between all parties concerned, an appeal for assistance was made to the U. S. Interstate Commerce Commission

As a result, Frank H. Alfred, president of the Pere Marquette R.R., has been appointed coal traffic manager for Michigan, and he has delegated the work to E. C. Campbell, president of the Michigan Gas Association, to collect information on the coal requirements of the gas and electric companies.

A list will be forwarded to the coal committee in Washington, of the gas and electric companies, with a report of the number of days' supply of coal each has.

The Federal authorities expect to expedite coal shipments to the companies in most urgent need, and Mr. Alfred gives assurance that shipments will be dispatched after their arrival in Michigan.

Many of the gas and electric companies have not more than a three or four days' supply of fuel. Detroit has been almost wholly dependent on coal in local railroad yards and shipments coming in in small allotments. Most of this supply has now been exhausted.

Lake Trade—Owing to the railroad strike and the urgent demand for coal in lower Lake markets, little stock is available for shipment up the Lakes. The supply arriving at lower Lake ports is so scanty that few of the Lake freighters have been able to begin operations. In some instances motor trucks have been used to get coal to vessels requiring fuel. In other cases freighters have been shifted to other ports where coal might be had.

CHICAGO

Railroad Situation Better and Strike May Soon Be Over—Dealers Placing Smokeless Contracts at Fair Prices.

The situation in Chicago is a trifle better than it was last week. Considerable coal is coming in and the railways are making a strong effort to rush steam sizes through to various factories in order to keep them from closing down. The retail yards, too, are in better shape, especially on the north and northwest sides, where last week there was quite a serious coal shortage. It is freely predicted that if the railroads continue their aggressive plans and keep on replacing the striking switchmen, the strike will soon be broken and the situation will once more be normal.

It was heard this week that several of the retail dealers here had succeeded in placing contracts for a substantial tonnage of Pocahontas and other smokeless coal. The contracts, of course, were made with firms who took care of these retailers during past years. We are advised that the prices named on the various contracts closed were quite fair, considering the general situation. West Virginia and Kentucky coals are still very scarce, and the retail trade is not counting on a very heavy tonnage moving west this year.

MIDWEST REVIEW

Output of Illinois Districts Purchased —Product Not Oversold—Coal Sold at April Prices—Car Supply Improving but Still Bad—Strike to be Broken Soon.

There is no coal market in Chicago this week because no one has any coal for sale. The output of the southern Illinois mines was removed from the market first, and the production of other districts was purchased soon afterward, in the order of excellence. Operators are showing decided tendencies not to oversell their product, and everybody out here in the coal business is going exceedingly slow.

The whole trade has been badly disorganized on account of the switchmen's strike. Coal has been taken out of its accustomed channels, forced through others, and many temporary changes are the result. Manufacturers and retailers in the country are benefiting largely, as, on account of the embargoes at the big industrial centers, all coal is moving to outlying districts and towns, thus giving some manufacturers and retailers a little coal for storage purposes.

Car supply continues bad, although it has been considerably better than last week. The strike breakers on duty at the various terminals have returned a large number of empty coal cars, which were held in the Chicago switching district, and at Peoria and St. Louis. The market continues to be flooded with anxious purchasing agents, but the distributors and operators in the Middle West are refusing to sell their coal at premiums over the market prices published early in April.

The switchmen's strike is still interfering with industries here and a large number of plants have been forced to close down both on account of lack of fuel and the fact that they are unable to get cars in which to ship their finished products. The railroads in and about Chicago are bending every effort

to clean up their yards without the aid of the strikers and they are making excellent progress. It is believed the strike will be completely broken within the course of another week.

South

LOUISVILLE

Little Coal Contracting on High and Uncertain Market — Better Tonnage Expected to East, North and Northwest—South in Fair Shape.

Coal production too short for summer stocking at present time. Car shortage in April worst ever known. Prices high and contracting light.

A few coal contracts are coming in for Lake movement and from sections of the North and Northwest, but as a whole little coal contracting is being done on the present high and uncertain market; buyers hope for a lower market, and producers are not anxious to tie up production.

If car supply shows reasonable increase, and promise of becoming at all steady, contracts should be taken freely. Northwest coal men are beginning to order early regardless of high prices.

The embargo situation has opened up somewhat, and far better tonnage movements to the East, North and Northwest should result. The movement for the past few weeks has been largely south. Railroads are asking for coal and seizing a considerable amount while the gas and byproduct plants are also clamoring.

A big contract has been made between the Hazard field operators and M. A. Hanna & Co., and other Lake operators, for a shipment of about one-half of last year's tonnage at a price of $4.25 a ton for 1¼-in. lump, to move through Toledo to the Northwest by Lake.

Gas coal and domestic are in good demand, with a fair demand for steam coal. It is estimated that car supply of the Louisville & Nashville in Kentucky is only 30 per cent of requirements for April, this being by far the worst month in the history of the field.

Hazard fields are quoting a price of $4.50 for mine-run at mine, prices not being available on screenings or domestic, none being sold.

The Harlan field is quoting prices at mine as follows: Domestic, $4.50@$6; mine-run, $5.50@$6; screenings, $4@$4.50. High-grade gas coal is in big demand and operators can get top prices for output.

Western Kentucky is quoting lump at $3.25@$3.40; mine-run, $2.85@$3; nut and slack, $2.50@$2.60; pea and slack, $2.25@$2.35, at mine.

Smokeless, anthracite and eastern Kentucky coal are quite scarce in the Louisville market. There is little demand of any kind, as the coal is not available.

BIRMINGHAM

Demand Strong, Spot Buying Brisk and Contracting Progressing—Operators to Protest Preferential Car Supply.

With a strong and continuing demand for all coal that can be produced in this field, conditions are in more satisfactory shape than for many months. Spot buying is brisk and contracting by steam users has made good headway. The Atlantic Coast Line and the Louisville & Nashville closed contracts during the week for fuel coal for the next twelve months, and agreements with the Frisco and other lines will be signed during the week.

There is a heavy demand for bunkerage coal at the ports of Mobile, New Orleans and Pensacola, and the amount of this business booked is only limited by coal supply and equipment for this movement.

No improvement is reported in equipment supply for the mines in the district, the average furnished in the field ranging from 65 to 70 per cent. A delegation of coal men will protest the order of the Interstate Commerce Commission, authorizing preferential car supply to mines furnishing fuel coal for the railroads.

Domestic coal has been contracted for extensively, and retailers are slowly stocking, the supply of this grade of fuel being much short of needs.

Quotations on steam coal have fluctuated little the past week and are as follows per net ton mines:

	Lump	Prepared
Big Seam	$2.95 @ 3.35	$3.45
Black Creek	4.00	4.45 @ 4.50
Cahaba	4.00 @ 4.35	4.35 @ 4.50
Carbon Hill	3.35 @ 3.50	3.50
Nickel Plate	3.35 @ 3.50	

Domestic grades are quoted as follows per net ton mines:

	Lump
Big Seam	$3.50 @ 3.60
Black Creek	5.00 @ 5.75
Cahaba	4.60 @ 6.00
Carbon Hill	3.60 @ 3.85
Montevallo	7.15
Corona	4.65
Straven (Montevallo)	6.75

West

TORONTO

Anthracite Situation Shows Improvement—Bituminous Remains Unchanged.

Conditions as regards supplies of anthracite show improvement, and a fair amount is now coming forward. On account of continued cold weather and the general desire of large consumers to lay in stocks early in the season, dealers have large orders on their books and new orders are generally being refused. The bituminous situation remains practically unchanged. Very little is being received and industrial plants are only kept running from day to day. Dealers are not quoting wholesale prices.

Quotations for short (retail) tons are as follows:

Anthracite egg, stove, nut and grate, $14; pea, $12.50; bituminous steam, $11; domestic lump, $12.50; cannel, $14.

COAL-TAX LEGISLATION

Legislative Action on Coal-Tax Matter—Governor Morrow Favors Plan—Conference Suggested of Governors of All Competing States — Replies Received.

During the recent session of the Kentucky Legislature, coal bill after coal bill placing tonnage tax on production was killed. The *Louisville Times* suggested editorially that as operators claimed such action was impossible, due to lack of similar laws in other states, thus working a discrimination against Kentucky operators, the various states appoint committees and get together on the matter.

This suggestion has borne fruit. As early as Jan. 20, 1920, Lieutenant-Governor Ballard corresponded with the governors of other states as to the possibility of placing coal-tonnage taxes on an equitable and uniform basis in all the bituminous coal-producing states.

During the legislative session, bills introduced were hurriedly thrown together without regard for low and high-grade coals, necessary differentials and conditions in non-taxing states, which would have an advantage over Kentucky.

Governor Morrow is said to favor the drafting of a uniform bill that can be used in Kentucky and other states, to become effective in all the states of the central competitive field at the same time.

It has been suggested that a conference of the governors of the states of the central competitive field be held in midsummer, probably at Louisville, in order to discuss the plan. Noncommittal replies are said to have been received from Governor Lowden, of Illinois; Governor Cornwell, of West Virginia, and Governor Davis, of Virginia, all of whom favored the conference.

Governor Sproul, of Pennsylvania, stated that a tax on anthracite was held unconstitutional if bituminous coals were not included. Governor Cox, of Ohio, in his reply referred to action of the Legislature of his state in turning down such a bill. Governor Goodrich, of Indiana, said that Indiana could not act without other states coming in.

Governor Gardner, of Missouri, is reported as approving the plan, and referring to such a tax in Oklahoma. Governor Roberts, of Tennessee, feared that such a tax would be unconstitutional Charles H. Brough, Governor of Arkansas, enthusiastically supported the plan.

If the conference is arranged, it is believed that all the governors will attend, and that the matter will be thrashed out. The movement is attracting much public attention.

News From the Coal Fields

Northern Appalachian

PITTSBURGH

Heavy River Shipments — Rail Shipments Little Improved — Market Quiet.

Railroad conditions, as affected by the strikes of switchmen, have not improved much. Most of the yards in the Pittsburgh district and for some distance west of here are tied up almost as badly as at any time, and it is still difficult to make coal shipments in normal manner.

Considerable coal is being moved, partly by increased use of the Monongahela River and also through the sending of through trains. The river shipments are chiefly to points in the immediate Pittsburgh district, and even the trainloads do not go far. There is some loading of cars that either remain on coal company sidings or move to railroad sidings not far from the mines.

Many mines are equipped for both rail and river shipment. Week before last coal shipments by mines that have river facilities only amounted to 24,000 tons, while mines having both rail and river facilities shipped about 80,000 tons by river. Including trainload coal and other loadings that may not have gone far, the total of loadings and actual shipments was about 30 per cent of the Pittsburgh district's normal.

The coal market in general is very quiet. The market is quotable, generally, at $3.50@$4 for contracts and $4@$4.50 for prompt lots, per net ton at mine, Pittsburgh district.

CONNELLSVILLE

Coke Yards Congested—Transportation Little Improved — Varied Byproduct Situation.

Movement of Connellsville coke is somewhat improved, but is still only between 60 and 70 per cent of the rate obtaining prior to the rail strike. Little coke is moved through the regular channels. There is a heavy coke movement by water and also by solid trainload requiring little or no switching or yard service.

Railroad yards in and near the region are reported congested with loaded coke, and there are also piles at the hand-drawn ovens, but it being hardly feasible to pile coke at machine-drawing operations.

The byproduct ovens are having various experiences. The Cleveland plants are doing relatively little and those at Youngstown practically nothing. Lorain and Benwood are operating practically normal. In the immediate Pittsburgh district both the byproduct and the beehive ovens are operating normal, their regular source of coal supply being by river.

The market is quiet, with sales possible only to a small fraction of the total number of consumers. Such sales are made at prices obtaining before the rail strike began—$11@$12 for furnace and $12@$13 for foundry, per net ton at ovens, Connellsville region.

Coke movement slightly improved, at 60 to 70 per cent of rate before rail strike. Byproduct ovens have various experiences.

EASTERN OHIO

Mines Returning to Normal—Lake Coal Begins to Move—Outlaw Strikers Reporting for Work.

After the first few days of the weekly period ended April 24, mines in the northern Pan Handle of West Virginia and in eastern Ohio began to show signs of returning to normal. Striking yardmen on the Pennsylvania at Wheeling voted to return to work on April 20 and had reported for duty to some extent on the twenty-first.

Suspension of the coal movement through Holloway, caused by a strike of Baltimore & Ohio yardmen at that point, was ended when the strikers there returned to work by the middle of the week and Lake coal began to move. The Baltimore & Ohio reported a freight business 55 per cent of normal on the nineteenth and it was estimated that the freight runs of April 20 amounted to 75 per cent of normal.

Yardmen and brakemen on the Cleveland & Pittsburgh R.R. were obstinate about returning to work, and hence coal production was retarded in Ohio. Striking yardmen of the Wheeling & Lake Erie at Wheeling were the last to report for work, but trains of coal were beginning to be moved.

FAIRMONT

Little Commercial Coal Shipped—Assigned Cars Deprive Many Mines of Tonnage—Tidewater Embargo Lifted.

With the railroads in northern West Virginia working overtime in furnishing assigned cars and with cars extremely limited at best, comparatively little commercial coal was produced and shipped from various fields here during the week ended April 24. When the car shortage became most pronounced at the end of the week, operators were informed that there were only enough cars for railroad fuel, and mines not loading such fuel were compelled to go without cars.

While transportation conditions were somewhat improved in northern West Virginia fields, there had not been a full recovery from the effects of the rail strike. However, producers were able to consign coal to certain points closed during the previous week, as for instance to the Lakes via Holloway, but in general the movement of coal from the mines and yards was retarded.

The tidewater embargo as far as Curtis Bay was concerned was lifted. Owing to a congestion at the Brownsville, Pa., yards of the Monongahela R.R., it was several days before Monongahela and Morgantown & Wheeling mines were able to operate.

The car shortage was still making itself felt in the northern regions of the state throughout the week, the daily supply not averaging more than

Estimates of Production

FROM THE WEEKLY REPORT OF THE GEOLOGICAL SURVEY

BITUMINOUS COAL

	1920 Week	1920 Calendar Year to Date	1919a Week	1919a Calendar Year to Date
April 10b	9,644,000	150,120,000	7,544,000	118,730,000
Daily average	1,607,000	1,740,000	1,257,000	1,376,000
April 17b	7,559,000	157,679,000	7,411,000	125,141,000
Daily average	1,260,000	1,708,000	1,235,000	1,367,000
April 24c	8,473,000	166,152,000	7,378,000	133,519,000
Daily average	1,412,000	1,690,000	1,223,000	1,538,000

a Less one day's production during New Year's week to equalize number of days covered for the two years. *b* Revised from last report. *c* Subject to revision.

ANTHRACITE

	1920 Week	1920 Calendar Year to Datea	1919 Week	1919 Calendar Year to Date
April 10	1,488,000	23,106,000	1,792,000	20,363,000
April 17a	1,190,000	24,296,000	1,603,000	21,966,000
April 24b	1,516,000	25,812,000	1,435,000	23,401,000

a Revised from last report. *b* Subject to revision.

BEEHIVE COKE

Week Ended Apr. 24, 1920c	Apr. 17, 1920b	Apr. 26, 1919	1920 to Date	1919 to Datea
341,000	246,000	259,000	7,012,000	7,108,000

(All figures in net tons.)

a Less one day's production during New Year's week to equalize number of days covered for the two years. *b* Revised from last report. *c* Subject to revision.

600 cars for the Fairmont region, for instance. Owing to the fact that so little commercial coal was being produced, prices were advancing quite materially in the Fairmont and other northern West Virginia regions as the month drew to a close.

Middle Appalachian

POCAHONTAS AND TUG RIVER

Little Coal Goes West—Heavy Eastern Tonnage—But Mines Work Only Day or So During Week—Car Supply 40 Per Cent for the Field.

With yardmen and switchmen of the Norfolk & Western still on strike during the greater part of the week ended April 24 at Kenova, Ashland, Portsmouth and Columbus, western service on this road was still so greatly impaired that little coal from the Pocahontas, Tug River and Kenova-Thacker fields was being shipped westward. For the same reason no cars were being obtained from western points.

The only coal handled by the road to western points was that in solid trainloads not requiring any switching. Production was at a lower ebb than during the previous week. In many instances mines were unable to work more than a day or so during the entire week.

There was a heavy eastern movement of coal from Norfolk & Western mines, more especially to tidewater. Dumping was on such a large scale that most of the coal arriving was speedily unloaded.

Conditions in the Pocahontas field were similar to those during the previous week, production losses being sustained through seriously impaired transportation facilities. Few cars being supplied from the West and no shipments in that direction.

There continued to be quite a heavy demand for export coal and much of the product of the Pocahontas field was being so consigned. With a 40 per cent car supply many mines found it difficult to operate after the first day or so of the week. Had there not been a good many bottoms at tidewater, it is believed congestion would have been inevitable.

Production in the Tug River field was 68,000 tons for the week ended April 24, exceeding even the output for the week ended April 3. But idleness at many mines was the rule rather than the exception. Coal held at Portsmouth, during the yardmen's strike, had begun to be weighed and moved, but the movement westward was rather light in volume, and the bulk of the cars for the field was still coming from the East. Speculators were receiving no encouragement in endeavoring to secure a large tonnage in the field, with a view to increasing prices. Pools Nos. 41, 42 and 43, at the tidewater terminal of the Norfolk & Western, were embargoed on April 26. That affected the shipment of the lower grades of coal from this field.

NEW RIVER

Shortage of Cars—Heavy Demand at Tide and Many Vessels to Load—Big Prices Offered.

The principal obstacle to large production in the New River field during the week ended April 24 was a shortage of cars. There was not more than a 40 per cent supply in that field, averaging the week as a whole, total production reaching only about 117,000 tons. While shipments of New River smokeless were not affected by an embargo, as was the case with high-volatile coal, nevertheless it was regarded as certain that such embargoes would indirectly affect the field inasmuch as equipment could not be released promptly.

There was an unusually heavy demand at tidewater for the New River product, with an ample number of vessels available for loading. Big prices offered by speculators, running as high as $11 a ton at tidewater, were frowned upon by producers. No New River coal, or coke either for that matter, was shipped to western points owing to a continuance of the strike at Russell, Ky., and sub-normal transportation conditions existing elsewhere.

During the week ended April 24, in the Winding Gulf field, there was a 60 per cent car supply on the Virginian and a 40 per cent car supply on the Chesapeake & Ohio. There was quite a stiff demand for smokeless coal at tidewater. Operators believe that there will be no betterment in the car supply in the Winding Gulf field for several weeks.

The Virginian Ry. is furnishing the mines on its line with blueprints showing the dimensions of the road's new 120-ton car so that operators could make any necessary adjustments to their tipples in order to take care of the new type of gondola. One thousand have been purchased, delivery to be made starting July 1 at the rate of from 15 to 20 cars a day.

KANAWHA

Mines Close Due to Rail Strikes in the East and Congestion at Tide—Slides and Washouts Keep Down Production.

Mines in the Kanawha district fared worse from a transportation standpoint than mines in the New River field, for several reasons. Not only was the car supply running shorter, but Kanawha mines were embargoed both east and west. The western outlets were closed, due to the failure of striking yardmen to return to work at Russell, Ky., while tidewater terminals were closed owing to a congestion growing out of the greatly increased shipments made during the previous week. In fact shipments were permitted only to inland points throughout the week.

With Kanawha & Michigan bridges washed out in Ohio, and with no cars obtainable from the East, all the mines on the north side of the Kanawha River in the Kanawha field were closed down, only 65 cars being loaded during the entire week, a total of 3,250 tons.

On April 23 not a single ton of coal was loaded either on the Kanawha & Michigan or the Kanawha & West Virginia, a subsidiary. Production would have been light even had there been no washout, owing to the fact that rail conditions were not normal either at Columbus, Toledo or other points. Owing to numerous embargoes, of course, it was still impossible to begin Lake shipments.

According to many operators, the assigned-car evil was fast becoming intolerable. Instances were numerous where mines furnishing railroad fuel had as many as 40 and 45 assigned cars over and above their regular allotment—even had empties left over—while other mines were forced to go without cars. This was affecting commercial coal mines because it was leading miners to desert commercial mines and seek work at railroad-fuel mines.

LOGAN

Bad Conditions in Logan Field—Car Shortage and Slides—Coal Goes to Inland East—Big Demand for Logan Coal.

Conditions were worse in the Logan field from every standpoint than at any time in recent months, during the period ended April 24, with car-shortage losses approximating 275,000 tons. The total production was not over 120,000 tons for the week, a decrease of 35,000 tons as compared with the previous week.

There was an actual shortage of cars and at least twice during the weekly period; slides made it impossible to reach the mines with empties, the result being general idleness at most mines during the greater part of the period ended April 24.

With a strike still in force at Russell, Ky., and with other western markets closed, the only outlet for Logan fuel (aside from that supplied the railroads) was to inland East points, since all high-volatile shipments to tidewater via the Chesapeake & Ohio were prohibited under an embargo. With a large number of cars at tide still unloaded and with Eastern points only furnishing empties, it was not strange that cars were so scarce.

NORTHEASTERN KENTUCKY

Slight Gain in Output—But Mines Work Only One to Two Days a Week—Poor Showing for April—Spot Prices Unsatisfactory.

Only 90,575 tons, or 33 per cent of full time capacity (276,670 tons), were produced in the northeast Kentucky field during the week ended April 24, that leaving a loss of 186,095 tons or 67 per cent; the car shortage being responsible for a loss of 64 per cent. There was a gain over the previous week of approximately 10,000 tons, all being at Chesapeake & Ohio mines,

due to the district's tidewater outlet at Charleston, S. C., and the running of solid trains from the district to points in the Middle West, eliminating switching, weighing and classifying at the Russell scales, where the switchmen still are on strike.

The situation at Louisville & Nashville mines was worse than it had been during the previous week, mines here working one full day during the week, with mines on the Chesapeake & Ohio working two days.

Production for the month, including April 24, had amounted to only about 400,000 tons, or 25 per cent less than for the same period in March, and with little prospect of the strike's conclusion. It was estimated that the month of April would show a falling off as compared with March of easily 200,000 tons. The total losses in production in April (barring the last week) had aggregated 575,000 tons, out of a total potential capacity of about 900,000 tons. This made the average working time until the twenty-fourth for the month 39 per cent. Production for the same period of 1919 had been 101,570 tons.

Prices quoted on spot shipments in the northeast Kentucky field did not reach anything like the level which might have been expected, although the previous disparity between export and domestic prices had been wiped out.

Middle Western

INDIANA

The mines in Indiana, the last week of April, were averaging between two and three days a week, the car shortage being responsible for losses of about 43 per cent of full time, labor trouble for 6 per cent and mine disability 6.3 per cent. The Terre Haute & Southeastern and the Southern railways made the poorest showing on car supply, the Big Four and the Chicago & Eastern Illinois, among the larger railroads, furnishing the best supply. This was an improvement over the week ending April 17, when the mines averaged barely two days a week. Production increased from 276,000 to 369,600 tons for the week ending April 24.

The market continued strong, with spot prices averaging about 50c. above the old Government prices. The adjustments of some old contracts to cover the wage advance of April 1 have been as low as 30c. per ton, but in general $2.85 mine-run f.o.b. mines represents the starting point for price quotations.

DUQUOIN

Production of coal in Southern Illinois has been reduced practically to a minimum mainly on account of the continued strike of the switchmen in Chicago. Most mines through southern Illinois have now fallen below 20 per cent of the average production, and no immediate prospect is in sight for a change even when the striking railroaders return to work. In the Franklin and Williamson county districts the percentage has been better, probably because these two counties are served with more roads than others. Coal officials have predicted that the mines will have trouble getting enough cars for capacity loading, far into the summer, owing to the congested conditions of the terminals.

A deal of importance was recently consummated in the purchase of two mines in Williamson County by the Big Ben Coal Co. The mines were owned by the Johnston City Coal Co., of Chicago. The Big Ben will add, by this purchase, 1,250,000 tons of coal annually to its already large production in southern Illinois. The new owners state that the main reason for purchasing these two large mines was due to the fact that the coal land purchased lay in such a position that the company could mine the coal from some of the original Old Ben mines, which otherwise could not have been easily reached.

The operators of the Hallidayboro mine, nine miles south of here, are rushing the work on the erection of the new steel tipple, which is to replace the large wooden one recently destroyed by fire. The mine is controlled by the Jackson Coal Co., of Chicago, and was said to be the largest producer in Jackson County. It is planned to have the mine in operation again within 60 days.

Drilling is being done in Jackson County, southwest of here, by the Big Muddy Coal & Iron Co., and it is expected that work will be started at once on the sinking of one or more mines in this district. The drillers found a seam about 4½ ft. thick and are drilling further to reach a lower seam said to be about 400 ft. deep. The company now owns three producing mines in the neighborhood and this new plant will make a large addition to the annual output of the concern. The mines will be served by the Illinois Central R.R., the Carbondale & Murphysboro Traction Co., and probably the Iron Mountain and the Mobile & Ohio railroad.

The large rescreening plant, which was built by the Rutledge & Taylor Coal Co. at its mine three miles south of this city, is about in running order. The plant was designed by the Link Belt Co., Chicago, and was started in January.

Canada

The Lignite Utilization Board of Canada is expected to make important advances this year in the development of the Saskatchewan lignite coal fields and the furnishing of the people of the prairie provinces of the Dominion with cheaper and better fuel. One of its definite objects is to place the briquetting business on a commercial basis. For the use of the board there has been appropriated the sum of $400,000 by the Dominion, Manitoba and Saskatchewan governments. The former is to contribute one-half of the amount and the two latter one-quarter each.

Nanaimo, B. C.—Coal lands situated close to this town are being developed. A shaft is being sunk and it is expected that coal will be taken out in a short time. The new company has purchased the machinery of an old adjacent mine to use in its development operations.

There is a dispute as to the title to some 1,222 acres of Vancouver Island coal lands. This property at present is held by the Canadian Collieries, Ltd.

It originally belonged to the old Baynes Sound Coal Mining Co. and attained a considerable development. In 1904, when the Provincial Government reached an understanding with the Esquimalt & Nanaimo Ry. Co., by which coal rights within the island railway belt were secured for a number of old-time settlers, in return for which the railway company was granted further lands in the northeastern section of the island, operations had ceased at the Baynes Sound collieries.

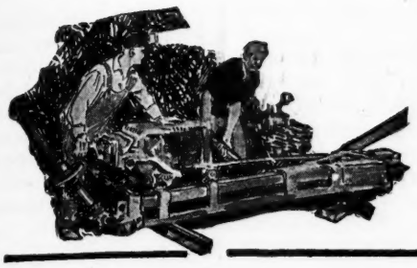
The property of the Baynes Sound company came within the limits of the supplementary railway land grant. It was found, however, that the railway company did not obtain possession of the Baynes Sound holdings. However, certain other property, in the northeastern section, was staked out by the railway company, later transferred to the Wellington Colliery Co. and thence to the Canadian Collieries, Ltd.

Messrs. E. T., C. H. F and E. A. Carew-Gibson and E. Priest contend that the railway company did not stake the land accurately, and that they are the only ones who complied fully with the law, following the lapse of the Baynes Sound Coal Co.'s leases. On this ground they are asking for possession. This demand being refused by the committee of the Legislative Assembly, the claimants assert that they will carry their case to the courts.

Huntington, W. Va.—Members of the Logan Operators' Association, at a meeting held in this city, went on record as being opposed to the assigned-car system on the present basis of distribution. The subject was raised by the decision of the Interstate Commerce Commission, announced on April 15. The matter was referred to the executive committee for further action.

Illinois and Wisconsin Retail Coal Dealers' Association will hold its annual convention Aug. 4 and 5 at Milwaukee, Wis. Secretary, I. L. Runyan, Chicago, Ill.

The Industrial Relations Association of America will hold its second annual convention at the Auditorium Theatre, Chicago, Ill., May 19, 20 and 21. Assistant Secretary, E. A. Shay, Orange, N. J.



Mine and Company News

ALABAMA

Birmingham—One battery of 60 ovens of the Sloss-Sheffield Steel & Iron Co.'s new $6,000,000 byproduct plant at North Birmingham began operation recently. Construction of the new plant is nearing completion, and Vice President Hugh Morrow states that fires under the second battery will be started at an early date.

The plant has two batteries of 60 Semet-Solvay ovens each, with a coking capacity of 2,500 tons of raw coal every 24 hours. The coke will be used by the furnaces of the company and the breeze and screenings for boiler fuel. The tar produced will be marketed as a crude product at present. No tar-refining equipment has been installed and such refining is not contemplated during the initial operation of the plant.

Equipment for the ammonia distillates is being installed. The light oil will be refined and the products marketed.

Tests made of the coal which will be supplied to the plant indicate a 24-hr. production of the following byproducts: About 20,000 gal. crude tar; 60,000 pounds ammonium sulphate, or equivalent in liquor, 17,000 gal. light oil, or equivalent in fractionated products and 1,800 tons of coke. The products noted will result from the operation of the two blocks of ovens.

The fuel-gas surplus has not been accurately determined, as the boiler plant of 4,800 rated hp. will consume a large amount. The boilers will furnish, in addition to the plant needs, steam for an electric-power station, distributing to the company's various mines, quarries and furnaces. It is estimated, however, that 7,000,000,000 cu.ft. of gas will be available every 24 hours for market purposes.

ILLINOIS

Carlinville — Macoupin County coal records were broken when mine No. 2 of the Superior Coal Co. hoisted 5,382 tons of coal in eight hours. A total of 1,537 mine cars were required to get the fuel to the top and 107 railroad cars to haul it away

Chicago—The Ayrshire Coal Co., of Oakland City, Ind., has placed a contract with The Krehbiel Co., of Chicago, for a new steel tipple to be equipped with Jacobsen horizontal screens and picking tables, for its new mine at Oakland City.

Collinsville — The office and engine rooms of mine No. 17 of the Consolidated Coal Co., about two miles northeast of here, were destroyed by fire, which made a total loss said to be between $25,000 and $30,000. No one was injured. Because of the switchmen's strike, the mine has cut down its force and only 15 men were at work when the fire was discovered. They reached the surface safely. At least two weeks will elapse before the machinery can be replaced and the plant put in working order again. Kingdon Gould, of New York, a son of George J. Gould, is president of the Consolidated company.

Herrin — A temporary wooden tipple is being erected at the Sunnyside mine, near here, in Williamson County, Ill., the tipple and washer having been destroyed by fire on April 11. President Warden, of Chicago, visited the mine recently and announced definite plans relative to rebuilding. The temporary structure will be replaced by a steel tipple as soon as materials and labor can be secured. It is likely that the washer will not be rebuilt, but a modern rescreening plant will be constructed instead. It is said the mine began hoisting coal May 1, thus giving employment to about 450 miners.

The Sunnyside mine of the Sunnyside Coal Co., at this place, lost the tipple and washery by fire on April 11. The hoist and boiler house were saved. The origin of the fire is supposed to be defective wiring, and the loss is estimated at $100,000. Plans are being made to erect a modern steel tipple and the mine is expected to be working full time again within three months. A number of mines were closed down for a few days, in this section, on account of the drivers refusing to accept the raise in wages but all mines are now working again.

Harrisburg—According to reports, the Harco mine, near this place, in Williamson County, Ill., has recently closed a contract with the New York Central R.R., which calls for a shipment of 35 cars daily. The railroad company has agreed to furnish the cars. This means that the Harco shaft will be running steadily during the summer, when ordinarily two days a week is about the average running time.

Springfield—The Illinois Supreme Court has placed its stamp of approval on the use of connecting mines as escapements, in the case of R. R. Fowler, state's attorney of Williamson County, Ill., against the Johnson City & Big Muddy Coal Co. The decision reverses the Williamson County Circuit Court, which enjoined the company from using one of its mines as an escapement for a connecting mine. The objection to the escapement was made because it is more than two thousand feet from the hoisting shaft.

INDIANA

Clinton—Vermilion Coal Co., operating a mine in the Clinton field, has leased 1,700 acres of fifth-seam coal land from the United States Steel Corporation, and will sink a mine southwest of Clinton, on the Chicago & Eastern Illinois R.R. switch. Bricks for the boiler house are here and steel and boilers are being shipped to the mine site. The steel corporation operates the Bunsen mines at Universal, and is retaining a large acreage of its own adjoining the leased tract.

KENTUCKY

Madisonville — Equipment of the Sunlight Mining Co. of Hopkins County is being shipped from Birmingham, Ala., to this city which should enable the company to operate its mine within 90 days. Grading will commence at once and the construction of a tipple will also begin in a short time. The company will use its steam shovel for grading purposes and will also strip coal which lies near the surface. In places the coal is covered with only ten feet of earth, while at other points it is 60 ft. beneath the ground. The company will operate a drift mine after stripping the available coal. Both No. 11 and No. 12 seams of coal will be mined. J. S. Morrow, general manager, says that the company has 600 acres of mining rights situated on the Louisville & Nashville cut-off and the mine will be three miles southwest of this city.

Smalley—The Bucks Branch Coal Co. has recently increased its capitalization to $100,000, to provide for general business expansion.

Type—The Mitchell-Willis Coal Co. is arranging plans for extensive improvements at its plant to provide for increased operations. It is proposed to open additional mines to provide increased output, and the company's plans call for the construction of about 25 houses for miners' service.

Sergent, — The Acme By-Products Coal Co., Fleming, Ky., is understood to be arranging plans for the immediate construction of a new tipple at its local mining operations. Plans will also be made for the construction

of about 50 new dwellings to be used by miners.

MARYLAND

Cumberland — To arrange for increased coal transportation over its system, the Morgantown & Kingwood R.R., a subsidiary organization of the Baltimore & Ohio R.R., has purchased a total of 1,000 additional coal cars from the Lehigh Valley R.R. Approximately 35 mining operations are conducted along the lines of the company, with production averaging about 100 to 125 loads of coal daily.

For the proposed development of extensive coal properties in the Meadow Creek district, contract has been awarded to Boxley Brothers, Huntington, W. Va., by the Greenbrier & Eastern Ry. Co., recently incorporated, for the construction of a new steam-operated railway, estimated to cost in excess of $1,500,000 for initial work.

Spruce Bridge — The Consolidation Coal Co., Fairmont, W. Va., is understood to be arranging plans for the installation of machinery and equipment for the immediate development of a total of about 12,000 acres of coal lands in the vicinity of Spruce Bridge.

NEW YORK

New York — On May 1 many of the occupants of the Washington Building, No. 1 Broadway, left this old building, which has been the headquarters of the coal industry for many years. The building is now the property of the International Mercantile Marine Co. and will be altered to meet its purposes. Some coal firms now located in the building have been provided with offices on other floors. Those firms that recently removed to other quarters, in New York City, are the following:

Alden Coal Mining Co., Inc.	Grand Central Palace
American Coal Co.	111 Broadway
American Coal Exporting Co.	154 Nassau St.
Coaldale Mining Co.	350 Broadway
Emmons Coal Mining Co.	149 Broadway
Eyre Fuel Co.	80 Broadway
Frame, Friend & Stineman, Inc.	Grand Central Terminal
H. B. W. Haff	1 Broadway
G. D. Harris & Co.	522 Fifth Ave.
Hartwell & Lester, Inc.	154 Nassau St.
Industrial Coal & Coke Corporation	Marbridge Bldg., 1328 Broadway
F. R. Long & Co.	Marbridge Bldg., 1328 Broadway
Archibald McNeil & Sons Co.	Grand Central Palace
W. A. Marshall & Co., Inc.	25 Beaver St.
W. C. Mason & Co.	143 Liberty St.
Morrisdale Coal Co.	15 Whitehall St.
Robinson, Haydon & Co.	143 Liberty St.
Rochester & Pittsburgh Coal & Iron Co.	90 West St.
Seiler Coal Co.	90 West St.
Shawnee Fuel Co.	90 West St.
Smokeless Fuel Co.	154 Nassau St.
Spring Coal Co.	501 Fifth Ave.
Steamship Fuel Corporation	52 Broadway
Wholesale Coal Trade Association	90 West St.

New York—W. A. Marshall & Co., of 22 Beaver St., this city, will hereafter have a Canadian organization to be known as W. A. Marshall & Co. of Canada, Ltd. The officers will be W. A. Marshall, president; Raymond Havemeyer, vice president; David L. Morrison, secretary-treasurer; and R. R. Boon, managing director. The headquarters will be at 58 St. Francis Xavier St., Montreal. Mr. Boon is well known in Canadian coal circles and until recently was identified with the Canadian Import Co.

Brooklyn—Six long established coal companies in Brooklyn announced recently that they had completed a merger and henceforth will do business under the name of the Commonwealth Coal Co., Inc., with a capital of $3,500,000. The combination, it was said, will save $400,000 a year in overhead charges. Officers of the new concern are Richard J. Wulff, president; Rudolph Reimer, Jr., first vice president; Justin J. Rathjen, second vice president, and Walter H. Nelson, treasurer. Frank D. Tuttle is chairman of the board of directors. The firms participating in the merger are: John F. Schmadeke, Inc.; S. Tuttle Sons & Co.; Z. O. Nelson & Son; Rudolph Reimer; Jurgen Rathjen Co., and Harry Blinn Coal Co.

OHIO

Columbus — The Queen Shoals Collieries Co., incorporated under Ohio laws recently for the purpose of developing a tract of 2,000 acres of coal lands at Queens Shoals, W. Va., will probably change to a West Virginia corporation before organizing. Clyde H. Hoyt, of the Clyde H. Hoyt Coal Co., of Toledo, is the moving factor in the enterprise. D. H. Armstrong, of Columbus, is also interested. The tract has an operating mine which will be enlarged to produce 1,000 tons daily. The product will be sold through the Clyde H. Hoyt Coal Co., of Toledo.

Steubenville—J. W. Blower, president; E. W. Blower, secretary; D. C. Thomas, vice-president, and E. M. Blower, all connected with the Panhandle Colleries Co., which is operating a large mine on the Pennsylvania R.R., near here, were on the property recently inspecting progress. The announcement is made that the mine, which will have a capacity of approximately 1,000 tons daily, will be opened by the middle of the summer. The mine is a shaft operation and will be modern in every respect.

PENNSYLVANIA

Pittsburgh — C. B. Turner, and associates, are understood to have completed negotiations for the acquirement of a total of about 1,000 acres of coal properties located in the vicinity of Fairmont, W. Va., and plans are being arranged for immediate development of the field and the installation of machinery.

The Kresage Coal & Mining Co., a Delaware corporation, has recently increased its capital from $1,000,000 to $2,000,000 for general business expansion.

Scranton—It is stated that heavy damage has been caused by a fire raging in the upper seam workings of the Continental mine of the Delaware, Lackawanna & Western Coal Co. on the West Scranton mountains. The company is maintaining a day and night fire-fighting force in its effort to conquer the fire. The first is said to have started several weeks ago, but is confined to a small area. At first the company officials tried to fight the flames with ordinary means, but, failing to make headway, they concluded to seal up this section of the workings and then flush with culm.

Uniontown—The sale is announced of 1,450 acres of virgin Pittsburgh coal land in Clay Township, Monongalia County, West Virginia. The price ranges from $250 to $300 an acre, the total consideration being approximately $500,000. The coal lies up Dunkard Creek, and is pierced by the Morgantown & Wheeling R.R. The sale was made by E. D. Patterson, of Waynesburg, for the owners, to the Monongahela Development Co., a holding concern composed of Morgantown, W. Va., men. Identity of interests back of the purchase has not been disclosed, but this sale is understood to be a forerunner of other deals by large industrial concerns to insure adequate fuel supply for the future.

Waynesburg—Seven hundred dollars an acre was the price paid for 1,700 acres of coal lands in Cumberland Township, Greene County, according to a deed filed here. The land was sold by the Prospect Coal & Coke Co., of Uniontown, and others, to the Buckeye Coal Co.

Another, but smaller, tract of coal land has been purchased by the Greene Improvement Co., which recently completed a series of transactions involving large acreage in eastern and southern Greene County. In the latest deal 53 acres in Cumberland Township was purchased by the company from Mrs. Lucretia E. Garrettson, of Knoxville, for $26,760, or approximately $500 an acre.

VIRGINIA

Lynchburg—The Banner Fork Coal Co. has increased its capitalization from $1,000,000 to $1,200,000, to provide for general business expansion. S. D. Ferguson is president.

Richmond—The Richmond Collieries Co. has been incorporated with a capital of $500,000 to engage in general coal mining operations in the Richmond district. William Job is president, and L. M. Johns, secretary.

WEST VIRGINIA

Cecil—The Sterling Coal Company is understood to be arranging plans for the immediate rebuilding of the electric power plant and tipple at its local operation recently destroyed by fire with a loss estimated at about $50,000.

Charleston—A material increase in the capital stock of the Carbon Fuel Co., of Cabin Creek, in the Kanawha field, has been decided upon and authorized by the Secretary of

State. From $1,000,000, the capital stock has been increased to 1,250,000. J. R. Thomas, of this city, is the president of the company.

Charleston, W. Va.—The Stover Coal Co. has acquired the Brown Coal Co., with extensive holdings and operations at Nuttall in the New River field. The acquisition of the Brown company holdings, the purchase of new equipment and the construction of many new houses will involve an expenditure of about $700,000 or $800,000. The Stover Coal Co. has been organized with Holly Stover, of Chicago, president. He is also president of the Holly Stover Co., with headquarters in Chicago, the company operating in the Illinois field. Mr. Stover is also largely interested in the Stover Elkhorn Coal Co., operating in Kentucky, and in the Eclipse Pocahontas Coal Co., operating in the smokeless fields of West Virginia.

Fairmont, W. Va.—The Chesapeake Coal Co., with headquarters at Wheeling, W. Va., having recently materially increased its total capitalization, has entered the Marion County, W. Va., field. The Chesapeake company secured from the Fairmont & Monongahela Coal Co. 750 acres of Sewickley coal, on the waters of Buffalo Creek, near Barrackville in Marion County. The purchase price was reported to be about $250,000. The company plans immediate development, contracts covering the sinking of two shafts having already been closed. T. H. Johnson, of Bellaire, is the president of the Chesapeake company, being also an eastern Ohio operator. The vice-president is J. A. Paisley and the secretary-treasurer, C. H. Eberts, of Wheeling, W. Va.

Gilbert, W. Va.—The Guyan Collieres Corporation recently organized with a capital of $2,000,000, is arranging for the immediate development of about 11,000 acres of coal lands in the vicinity of Gilbert. It is understood that this property contains six workable coal seams.

Logan, W. Va.—Protest against the proposed rate increase in electric power applied for by the Kentucky & West Virginia Power Co. was made on April 21 by a delegation of 15 coal operators of the Logan field, headed by J. J. Ross, president of the Logan Operators' Association. The power company is asking for a 42 per cent increase, as well as a new form of contract, both of which are opposed by the operators.

Norwood, W. Va.—The Peacock Coal Co., of Clarksburg, W. Va., which recently incorporated with a capital of $150,000, has perfected its organization, with Olandus West, president; J. Horner Davis, vice-president; E. B. Templeman, secretary; and P. M. Robinson, treasurer. The company has completed negotiations for coal properties in the vicinity of Norwood, and is planning for the installation of machinery and for the development of the operation. Carl Hornor is general manager.

Wheeling, W. Va.—The Chesapeake Coal Co. has completed negotiations for the purchase of about 750 acres of the coal property holdings of the Monongah Coal Co. T. H. Johnson, Bellaire, Ohio, is president of the company, and C. H. Ebberts, Wheeling, is secretary-treasurer. The company has already awarded a contract for the sinking of two shafts on the property in connection with proposed development plans.

WESTERN STATES

Clarksville, Ark.—The Nichols-King Coal Co. is understood to be having plans prepared for the sinking of an additional mine at its local operation, to provide for increased output. J. E. Nichols heads the company.

Jefferson City, Mo.—The Millbrook Coal Co., Exchange Bank Building, recently organized, is planning for the development of extensive coal properties in Moniteau County, Mo., recently acquired under lease. Machinery and equipment will be installed, while electrically operated apparatus will be utilized wherever possible. A. L. McCawley, of Jefferson City; W. P. Grishorn and Raymond A. Becker, both of Kansas City, head the new organization.

St. Joseph, Mo.—The Black Diamond Coal Co. has been incorporated with a capital of $150,000 to engage in general coal-mining operations. The company has completed negotiations for the acquirement under lease of about 1,200 acres of coal properties in the vicinity of Mendota, Mo., and plans are now being arranged for immediate development. T. L. Greenleaf, P. A. Hilderbran, both of the St. Joseph, and W. S. Fleming, Kansas City, are the incorporators.

Eagle Pass, Tex.—The International Coal Mines Co. is having plans prepared for the installation of coal mining machinery and equipment for all features of operation in connection with the proposed development of about 2,880 acres in the Eagle Pass district. It is planned to have an initial capacity of about 250 tons daily. D. H. Echols is manager.

Spokane, Wash.—Four months after incorporation, the Harvard Coal Co., operating at Princeton, B. C., is ready to start shipments according to F. M. Goodwin, secretary-treasurer of the company, who has his headquarters in the Old National Bank Bldg. in this city. The company is planning extensive development work according to Mr. Goodwin.

Roanoke Rapids, N. C.—The Rosemary Mfg. Co. is planning for the installation of new coal-handling apparatus at its plant, in connection with other extensions and improvements. Arrangements for the entire work have been completed.

Flint, Mich.—Coal operations will be started here within a few weeks by the West Side Coal Co., composed of Cleveland and Chicago operators, who have taken over leases near the west end of the town, formerly held by the What Cheer Mining Co. This property includes a square mile of territory which is estimated to contain 4,000,000 tons of coal. The site of the plant is in Genesee County.

Omaha, Neb.—It was announced recently that orders have been placed for 2,000 steel coal cars for summer delivery to the Union Pacific R.R. They will cost more than $2,000,000.

Auburn, N. Y.—The Columbian Rope Co., of this place, manufactures hemp rope of various sizes, and to make it more difficult for others to counterfeit, a paper ribbon is inserted in one of the strands during manufacture. On this ribbon is stamped the name of the manfacturer, the address and the date of the patent. The advantages of this method of protection are obvious. A trade mark placed on the outside of the rope readily could be counterfeited by others. But a strand woven into the rope, at the time of its manufacture, or as in this case a ribbon of distinctive type, adds security.

Coming Meetings

The Rocky Mountain Coal Mining Institute will hold its annual meeting in Denver, Col., in conjunction with the National First Aid Meet, an Aug. 20 and 21. Secretary, F. W. Whiteside, Denver, Col.

M. O. I. Coal Association will hold its annual convention June 16, 17 and 18 at Cedar Point, Ohio. Secretary, B. F. Nigh, Columbus, Ohio.

National Retail Coal Merchants' Association will hold its annual meeting June 10, White Sulphur Springs, W. Va. Secretary-manager, Ellery Gordon, Philadelphia, Pa.

Kentucky Mining Institute will hold its annual meeting June 4 and 5 at Lexington, Ky. Secretary, C. W. Strickland, Huntington, W. Va.

American Society of Mechanical Engineers will hold its spring meeting May 24, 25, 26 and 27 at St. Louis, Mo. Secretary, Calvin W. Rice, 29 West 39th St., New York City.

West Virginia Coal Mining Institute will hold its annual meeting June 7 and 8, at White Sulphur Springs, W. Va. Secretary, R. E. Sherwood, Charleston, W. Va.

American Wholesale Coal Association will hold its annual meeting June 1 and 2 at Pittsburgh, Pa. Secretary, G. H. Merryweather, Washington, D. C.

The Colorado Retail Coal Dealers' Association will hold its annual meeting June 8, at Colorado Springs, Col. Secretary, E. Hopper, Denver, Col.

West Virginia Freeport Coal Operators' Association will hold its annual meeting June 3 at Kingwood, W. Va. Secretary, A. T. Carnahan, Akron, Ohio.

International Railway Fuel Association will hold its annual meeting May 24, 25, 26 and 27 at the Hotel Sherman, Chicago, Ill. Secretary, J. G. Crawford, Chicago, Ill.

American Institute of Electrical Engineers will hold its annual convention at Sulphur Springs, W. Va., June 29 to July 2. Secretary, F. L. Hutchinson, New York, N. Y.

National Coal Association will hold its annual meeting May 25, 26 and 27 at the Traymore Hotel, Atlantic City, N. J. Secretary, W. B. Reed, Commercial Bank Building, Washington, D. C.

The American Association of Engineers will hold its annual convention at the Planters Hotel, St. Louis, Mo., May 10 and 11. C. E. Drayer, secretary, Chicago, Ill.

Obituary

George Strebel for many years superintendent of mining properties in Belleville, Ill., and Edwardsville, Ill., died recently at Springfield, Ill., following a stroke of paralysis. He was 67 years old and a native of Switzerland. He is survived by his wife and five daughters.

William A. Hunt, assistant superintendent of the Pursglove mine, of the Pursglove Maher Coal Co., at Stewartsville, Ohio, was accidently electrocuted by coming in contact with a 66,000-volt current. He was handling a switch at the entrance of the mine at the time of the accident. Mr. Hunt was 29 years of age and had been with the Pursglove Maher Co. for the last ten years.

I. W. Seamans, a prominent Fayette County, Pa., coal and coke operator, died recently at his home in Uniontown, Pa., following an illness which has its origin two years ago. Mr. Seamans never regained his health following an operation in Philadelphia, in August, 1917. At one time he was a power in the coal and coke development in the Connellsville region, being identified with a number of operations. Mr. Seamans was associated with J. V. Thompson at one time in some of his big deals. His widow and five children survive him.

William A. Hunt, superintendent of the Purseglove mines at Stewartsville, Ohio, was instantly killed on April 7 while attempting to adjust a high-tension switch at the entrance to a mine, 66,000 volts electrocuting him. Mr. Hunt was quite well known in mining circles throughout eastern Ohio. He was in his twenty-ninth year and had been closely identified with the Stewartsville operation for several years, being a relative of the owners of the plant. He leaves a wife and two brothers and two sisters.

Harry Haskell Small, sales manager of the Goodman Manufacturing Co., Chicago, died April 4, of heart failure, after quite a brief illness. He was born Oct. 7, 1862, at Portland, Me., and received his theoretical training at Worcester Polytechnic Institute. After connection with other industries he came to the Goodman Manufacturing Co. in 1901, as manager of the contract department, and the following year he was made sales manager. It is said that the efficiency of the Goodman Co.'s sales department is due in great measure to Mr. Small's forcefulness, his methodical attention to business, his judgment in commercial matters and his intimate knowledge of mining machinery manufacture and use. He had a wide acquaintance throughout the mining industry.

James H. McClelland, aged 60, died of blood poisoning at his home in Brazil, Ind., following a recent operation. He was one of the pioneer operators in the Brazil block coal field and for many years was head of the Brazil Block Coal Co., which at one time was the largest producer of coal in Indiana. After the exhaustion of the Brazil mine he operated bituminous mines at West Terre Haute and recently purchased a large holding south of that city. Mr. McClelland was on many committees for the settlement of differences between miners and operators and represented the block coal fields in many national conventions. He was interested in the Citizens National Bank of Brazil, the Central Iron & Steel Co., and several industries. Mr. McClelland was chairman of the United War Work campaign which raised more than $35,000 in Clay County, Ind.

Personals

John Lloyd, efficiency engineer of the Lehigh Valley Coal Co., has resigned to take the position of local manager of the Perolin Co. of America.

S. W. Inns, of Philadelphia, Pa., has been appointed sales manager for Devoy & Kuhn Coal & Coke Co., to succeed **E. G. Ridgeway,** resigned.

David Fleming, formerly general manager of the mines of the Ebensburg Coal Co., at Colver, Cambria County, Pa., has resigned his position and will take up his residence at Greensburg.

L. C. Thomas has resigned his position in charge of the St. Louis office of the Bickett Coal Co., to accept service in fuel conservation with the Missouri Pacific R.R. He is succeeded by **M. D. Joyce.**

F. W. Holderman, formerly assistant division engineer of the Hazleton division (Luzerne County, Pa.) of the Lehigh Valley Coal Co., has been appointed division engineer of the Lehigh division of the same company, in place of **G. R. Wood,** promoted.

James S. Burgess, who was formerly division engineer of the Snowshoe division (Center County, Pa.) of the Lehigh Valley Coal Co., has resigned to accept the position of superintendent of the Evans Colliery Co., at Beaver Meadow, Carbon County, Pa.

L. A. S. Wood, prominent in illumination engineering circles both in this country and in Europe, has been made manager of the illuminating section of the supply department of the Westinghouse Electric & Manufacturing Co., with headquarters

Paul Jocquel, for many years sales manager of the Berry-Bergs Coal Co., of St. Louis, has resigned to go with the Union Fuel & Ice Co.

N. F. Lefavor has been appointed Southwestern Sales Agent for the Illinois & Indiana Coal Corporation, succeeding **F. M. Johnson,** who goes with the St. Louis Coke & Chemical Co.

L. G. McCarty, of Solvay Collieries Co., Hemphill, W. Va., has accepted a position as superintendent with the J. C. Sullivan interests, at their Bartletts Creek Plant, Wyoming County, near Mullins, W. Va., effective April 16.

W. L. Luce, formerly general manager of the mines of the Ellsworth Collieries Co., at Ellsworth, Washington County, Pa., has resigned his position. Mr. Luce was recently tendered a farewell banquet by officials of the company at Ellsworth.

H. I. Smith, formerly assistant general superintendent of the Vandalia Coal Co., of Sullivan, Ind., is now with the American Mining Commission at Belgrade, Servia, where an investigation is being conducted to determine the possibilities of coal mining in the Balkan States.

W. A. Luce, of Sewickley, Pa., recently resigned as general superintendent of the Ellsworth Collieries Co., a subsidiary of the Lackawanna Steel Co., a position which he has filled for several years. His resignation becomes effective May 1. The operations consist of several large well-equipped mines on the Ellsworth branch of the Monongahela division of the Pennsylvania R.R.

M. A. Buehler, formerly sales manager of the Western Electric Co. at its Omaha house, has been made sales manager at the Minneapolis office. Mr. Buehler joined the Western Electric Co.'s organization in the early part of 1915 and became sales manager at Omaha during the fall of 1917.

Eliot Lum has been promoted to the position of sales manager at the Omaha office of the Western Electric Co., to succeed Mr. Buehler. Mr. Lum entered the employ of the Western Electric Co. as a student in the educational courses in 1905, directly after his graduation from college. In 1907 he became a member of the telephone engineering department at Chicago, and in 1909 was transferred to the sales department of the Minneapolis house, joining the Omaha organization in the same capacity in the winter of 1912.

Edward L. Haas, who has been employed by the Union Collieries Coal Co., at Penton, Pa., as coal inspector, has been promoted to the position of safety inspector with the same company, over its five mines and will hold both positions for the present. Mr. Haas is president of the Renton Athletic Association and takes an active interest in community welfare work. He was formerly employed by the Equitable Coke Co., at its Harwick mine as assistant mine foreman.

P. A. Coen, formerly vice president of the Sunday Creek Coal Co., has been made vice president of the Philadelphia & Cleveland Coal Co., of Cleveland, which has opened an office at Columbus, Ohio. The Cleveland Company is now one of the important factors in the coal business in Ohio. In addition to the Columbus office the company maintains a branch in Wheeling, W. Va. Mr. Coen will spend his time between the Columbus and Cleveland office and in the field, and will specialize on Hocking coals.

James Dalrymple, state coal mine inspector of Colorado, recently won a decision in the Supreme Court sustaining his right to an increase of $400 a year in salary, allowed by the last legislature. State Auditor Strong had refused to issue a warrant covering the raise on the ground that the inspector's salary, under the constitution could neither be raised nor lowered during his term of office. Mr. Dalrymple contended that the constitutional bar was removed when his office was brought under civil service.

Arthur F. Martin, auditor for more than 12 years for the Davis Colliery Co. and the West Virginia Coal & Coke Co., Elkins, W. Va., and associated with the W. H. Green Coal Co. as sales manager since Jan. 1, 1920, has resigned the latter position to become associated with the Boone County Coal Corporation, at Sharples, W. Va., as auditor. **Harry B. Martin,** his brother, will be his successor.

C. H. Nesbitt, chief mine inspector for Alabama, has been re-appointed for another term by Governor Kilby. Mr. Nesbitt has had supervision over the coal mines, in the capacity of chief inspector, for a number of years, having served under three state administrations. Prior to his initial appointment he was connected with some of the larger coal-mining companies in an engineering capacity, and is well posted on mining conditions and problems in this field. **J. B. Corlin** has been appointed an assistant inspector to succeed Hugh Lynch, who resigned some weeks ago.

Joseph G. Bradley, president of the Elk River Coal & Lumber Co., has been elected president of the Gauley Coal Land Co., to succeed the late Colonel Higginson, of Boston. The Gauley company owns what is said to be one of the largest, if not the largest, acreages of coal and timber in West Virginia, much of the company's holdings in Greenbrier County having been leased within the last year or so. Mr. Bradley, new president of this company, is a director of the National Coal Association and president of the West Virginia Coal Association. He is also a trustee of the Cameron estate and of the Bradley estate.

Eugene McAuliffe, president and general manager of the Union Colliery Co., in an address before the St. Louis Railway Club, advocated coal storage during the low-consumption season. His subject was "The Bituminous Coal Industry and the Public." "During the period of low consumption," he said, "the excess coal should go into storage, and from this storage should be taken the monthly deficit occasioned by the season of high consumption. With a duty due to the thousands, who from force of circumstances cannot store coal during the summer season, the working class in particular, the operators and dealers should unite in their efforts to provide the proper storage for the coal, which becomes so essential during the long and especially hard winter."

Carl Scholz, a well known Chicago mining engineer, made his first trip by airplane from Charleston to Wyoming, both in W. Va., where he is superintending the opening of large coal mines. The trip did not result disastrously, nevertheless he did not make it unscathed, since when near his destination Mr. Scholz and his pilot were forced to land and the machine in which they were riding struck the branch of a tree in a ravine. Mr. Scholz had chosen the aircraft as solving the problem of getting to the Wyoming mines without the loss of a day's time on the railroad and succeeded in interesting other operators in the project. Where it formerly took him a day to reach the property the aircraft made the trip in 40 minutes. While Mr. Scholz sustained a number of cuts and bruises when the airship was forced to land, he has not abandoned his plan of using the air route as a quick way of getting to and from the operation in which he is interested.

O. C. Straight and **Fred B. McClure,** civil and mining engineers, successors to the Fairmont Engineering Co., have opened offices in the American Building, Fairmont, W. Va. This firm is equipped to do all kinds of engineering, both members of the firm having had considerable experience in the examination and making of reports on coal properties, in constructing mining plants and in building highways. Messrs. Straight and McClure bought out the Fairmont Engineering Co. March 20, and are now doing the engineering work for about 20 coal mining companies. O. C. Straight has had ten years' experience in mining engineering. He was with the Hope Gas Co. for three years. He has located many wells in West Virginia and in Pennsylvania. For two years he was assistant chief engineer of the Bethlehem Coal Co. His experience in highway construction consists of eighteen months' work in France with the A. E. F. For a time he was connected with the Fairmont Engineering Co.

Fred B. McClure has had four years' experience in mining engineering, during which time he was in charge of the mining operations (as engineer) of the Fairmont & Lowesville Coal Co. He engineered the construction and installation of the new plant of the company. He was also connected with the Fairmont Engineering Co. at South Bend, Ind.